



Department of Energy, Mines,
Industry Regulation and Safety

DRAFT

Guideline for preparing Mining Development and Closure Proposals

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Document Hierarchy for Mining Development and Closure Proposals

Legislation	<i>Mining Act 1978</i> Mining Regulations 1981
Policy	Environmental Regulatory Strategy Environmental Objectives Policy for Mining
Guidelines	This Document
Procedures	Environmental Application Administrative Procedures

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CONTENTS

PURPOSE	4
OPERATION	4
OBJECTIVES	4
SCOPE	4
1. Preparation of a Mining Development and Closure Proposal	6
1.1 Regulatory context	6
1.2 Pre-submission engagement	6
1.3 Approvals Statement	7
1.4 Submission of a Mine Closure Plan	7
1.5 Small mining operations	7
1.6 Amendments to information recorded on an Approvals Statement	7
2. Contents of a Mining Development and Closure Proposal	8
3. Description of Proposed Mining Operation	8
3.1 Proposal description	8
3.2 Activity envelope	8
3.3 Site plan	10
3.4 Activity details	11
3.5 Additional Information	13
4. Legislative framework	14
4.1 Mining operations assessed under Part IV of the Environmental Protection Act 1986	15
4.2 Mining operations requiring a Native Vegetation Clearing Permit under Part V of the Environmental Protection Act 1986	16
4.3 Interaction with Aboriginal Heritage Act 1972	16
5. Baseline data and analysis	17
5.1 Environmental and social setting	17
5.2 DEMIRS Environmental Factors	17
5.3 Land and soils	18
5.4 Water resources	22
5.5 Biodiversity	23
6. Stakeholder engagement	24
7. Post mining land use	26
8. Risk Assessment and Management	27
8.1 Risk Treatments	28

9. Environmental and closure outcomes	28
9.1 Standard environmental and closure outcomes.....	28
9.2 Site specific outcomes	29
9.3 Completion criteria.....	29
10. Monitoring.....	31
11. Closure implementation	31
11.1 Closure work schedule	32
11.2 Knowledge gaps	34
11.3 Early closure or suspension of operations	36
APPENDICES	37
Appendix 1 – MDCP Scoping Document template	38
Appendix 2 – Example landform summary table	42
Appendix 3 – DEMIRS environmental risk assessment framework.....	43
Appendix 4 – DEMIRS standard environmental and closure outcomes	56

PURPOSE

The purpose of this guideline is to assist the preparation of a Mining Development and Closure Proposal (MDCP) in accordance with the *Mining Act 1978* (Mining Act) and the Mining Regulations 1981 (Regulations).

OPERATION

This guideline takes effect from the date that amendments introduced by the *Mining Amendment Act 2022* become operational.

OBJECTIVES

The Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) is responsible for regulating mineral exploration and development activities in Western Australia (WA) under the Mining Act.

The objective of this Guideline is to clearly outline DEMIRS' expectations of the information to be included in a MDCP to ensure that:

- The proposed activities can achieve DEMIRS' environmental objectives.
- MDCPs submitted to DEMIRS meet the requirements set out in the Mining Act and Regulations.
- MDCPs received are of a high quality and provide sufficient detail on relevant factors.
- The information is targeted and proportionate to the nature, scale and type of activity being undertaken and the level of environmental risk posed by the activity.
- Requests for further information to the applicant are minimised.
- There is transparency around the environmental management expectations of DEMIRS for the mining industry and community.

SCOPE

This document relates to the Mining Development and Closure Proposal framework established by the (not yet commenced) *Mining Amendment Act 2022*.

This guideline applies to MDCPs lodged in accordance with section 103AL(2)b or (3) or 103AM(2)(b) or (3) of the Mining Act and Regulations.

The Mining Act requires that prior to undertaking any activity for the purposes of, or in preparation for, mining operations or carrying out mining operations on a tenement granted under the Mining Act, the activity must be included in a MDCP, approved under section 103AO(1) and recorded on an Approvals Statement. Activities must be undertaken in accordance with the Approvals Statement.

The Mining Act defines a "Mining Development and Closure Proposal" as a document that includes detailed information regarding:

- the proposed mining operations to be carried out;
- the decommissioning of any proposed mine to which the mining development and closure proposal relates;
- the rehabilitation of the land subject of the mining tenement to which the mining development and closure proposal relates;

- the closure outcomes; and
- any prescribed information.

1. Preparation of a Mining Development and Closure Proposal

1.1 Regulatory context

The primary purpose of a MDCP is to demonstrate to DEMIRS that proposed mining activities can be conducted in accordance with DEMIRS' [Environmental Objectives Policy for Mining](#).

DEMIRS' principal objective for environmental regulation is: *“Resource industry activities are designed, operated, closed decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed environmental outcomes and post-mining land-uses without unacceptable liability to the State”*.

To meet this principal objective, MDCPs need to demonstrate to DEMIRS that proposed activities can be conducted in a way that meets the following objectives for the key environmental factors relevant to mining activities:

Environmental Factor	Objectives
Land and Soils	To maintain the quality of land and soils so that environmental values are protected.
Rehabilitation and Mine Closure	Mining activities are rehabilitated and closed in a manner to make them physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating, and capable of sustaining an agreed post-mining land use, and without unacceptable liability to the State.
Water Resources	To maintain the hydrological regimes, quality and quantity of groundwater and surface water to the extent that existing and potential uses, including ecosystem maintenance, are protected.
Biodiversity	To maintain representation, diversity, viability and ecological function at the species, population and community level.

1.2 Pre-submission engagement

This document provides guidance on how to draft an MDCP that meets the requirements of the Mining Act and regulations. Applicants are encouraged to engage with DEMIRS prior to submission of the MDCP on key aspects of the proposal to facilitate an efficient assessment process.

A scoping document template has been provided as Appendix 1 and is also available on the DEMIRS website for applicants to complete prior to the scoping meeting. This template will assist in setting out the scope and key aspects of the mining activities, delineate regulatory agency responsibilities and identify any information gaps. The scoping document template is intended to guide applicants for scoping meeting discussions with DEMIRS and is not a mandatory document for approval.

The procedures for screening and assessing environmental applications and making decisions is set out in DEMIRS' [Environmental Application Administrative Procedures](#). This includes details on statutory and agreed administrative requirements for interaction of an assessment with those required under other legislation and target timeframes for completing environmental assessment.

1.3 Approvals Statement

Approval given to a mining activity proposed in a MDCP will be recorded on an Approvals Statement along with any conditions attached to the approval; any relevant information (information relevant to the nature and extent of the activity in the proposal); the closure outcomes included in a MDCP and the date by which a mine closure plan must be lodged.

To afford procedural fairness, tenement holders will be provided with an opportunity to review their Approvals Statement prior to it being formally issued. Once formally issued, Approvals Statements will be made publicly available per section 103AP(3) of the Mining Act.

1.4 Submission of a Mine Closure Plan

The MDCP functions as a targeted application document that captures information required for environmental assessment of proposed mining activities, including information regarding rehabilitation and mine closure.

Mine Closure Plan (MCPs) will still be required to be submitted to DEMIRS. Under section 103AT of the Mining Act a MCP for the relevant tenements must be lodged on or before the lodgement date recorded on the Approvals Statement to demonstrate that the mining operation is tracking towards successful closure. Further information on the requirements for a MCP can be found on DEMIRS website.

1.5 Small mining operations

A dedicated form to support applicants lodging MDCPs for small mining operations will be available. DEMIRS considers a small mining operation to be defined as:

1. scraping and detecting, including dry processing; and/or
2. excavations no larger than 40,000 m³, and/or
3. activities required to support small mining operations (e.g., camp, laydown, processing area).

DEMIRS generally considers that a small mining operation does not involve:

1. the mining of uranium, mineral sands, or rare earth elements; and/or
2. excavations that intersect groundwater; and/or
3. permanent landforms above the natural surface; and/or
4. amendments to sites or projects that are not considered small mining operations.

1.6 Amendments to information recorded on an Approvals Statement

For operations with an existing Approvals Statement, a new MDCP will need to be submitted to DEMIRS for assessment in the following circumstances:

- When new mining activities are proposed or when changes, expansions or alterations are proposed to mining activities beyond what is recorded on the Approvals Statement.
- When any mining activities are proposed outside of the activity envelope recorded on the Approvals Statement.
- When any changes are proposed to the tenements recorded on the Approvals Statement.
- To amend a closure outcome.

In each section of this document there is a subheading “Amendments to an Approval Statement”, which provides specific guidance on the level of detail that should be presented in the MDCP when seeking an amendment. This is intended to ensure all the relevant information is provided, to improve efficiency of assessment and simplify the process for amendments to existing operations. The level of information required in the MDCP will be dependent on the nature of the amendments proposed. For example, substantial changes or new mining areas will require a greater level of detail compared to minor amendments which result in limited changes to environmental impact and risk posed and/or may require limited changes to the information recorded on the Approvals Statement.

This section is not intended as a guide for tenement holders seeking to transition an existing mining operation to an Approvals Statement for the first time.

2. Contents of a Mining Development and Closure Proposal

The content requirements of a MDCP will be prescribed in the Regulations. This guideline details the information to be contained in a MDCP to assist in ensuring requirements of the Mining Regulations are met and that MDCPs submitted to DEMIRS provide sufficient detail on all relevant factors.

3. Description of Proposed Mining Operation

3.1 Proposal description

The MDCP must include a written description of the proposed mining activities that are subject of the proposal including the location of activities, the intended mine life and how the mine will operate and close.

Amendment to an Approvals Statement

When an applicant seeking an amendment to an existing mining operation the ‘proposal description’ section and table of the MDCP should clearly identify the new mining activities or changes to the activities on the relevant Approvals Statement. This section should provide a brief summary of the whole operation to provide context for the approval.

3.2 Activity envelope

The MDCP must define the spatial extent within which the mining activities will be located (an activity envelope). Through the Resources Online submission portal applicants will have the ability to enter their activity envelope through the DEMIRS spatial system (either via drawing directly on the spatial system or via shapefile upload). There will also be the ability to provide the activity envelope as a figure in the MDCP to further detail any relevant exclusions or sensitivities to be avoided.

The activity envelope provides the flexibility for applicants to locate mining activities (as outlined in the activity details table) anywhere within the area designated. The need for further approval through a MDCP will be triggered when changes are required to the activity envelope.

The MDCP assessment will consider the likely environmental impact(s) and risks of the proposed mining activities within the extent of the activity envelope. The risk assessment will need to identify the potential environmental impact of all activities proposed in the MDCP and

mitigate against those identified environmental impacts. For this reason, applicants will need to ensure baseline information provided in a MDCP considers the entire activity envelope. As an example, an environmental survey will need to cover the entire activity envelope area to ensure all environmental values that may be impacted or require protection are appropriately identified.

All land types intersected by the envelope need to be considered and their individual requirements met. For example, activity envelopes that intersect with reserves will need to ensure all reserve requirements (Mining Act consent, tenement conditions, etc.) have been met.

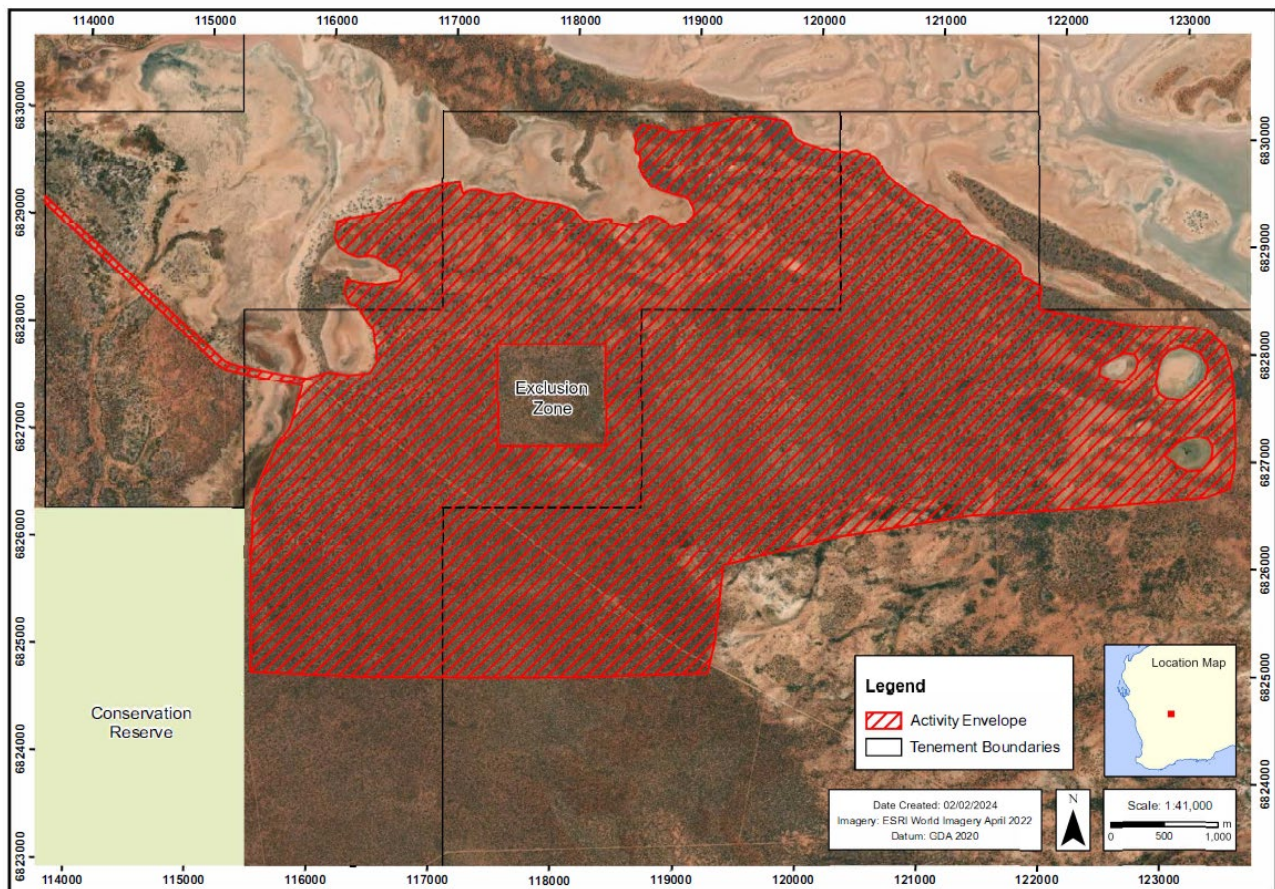
The activity envelope is used to indicate the maximum spatial extent of the mining activities, thus careful consideration should be given to ensure:

- Sufficient space is available to undertake mining activities including final closure requirements.
- Relevant baseline data has been collected for the entire activity envelope proposed.
- Mining activities are carried out to create the minimum practicable disturbance to the environment and where possible, sensitive features are avoided.

The activity envelope can be used to illustrate areas that will be excluded from the MDCP and within which no activities will occur (e.g. sensitive areas such as Aboriginal cultural heritage, reserves, wetlands, waterways, prominent ridges, etc.). The exclusion of sensitive areas from an activity envelope may result in some potential risk pathways being eliminated. Risk pathways that are eliminated based on the location of the activity envelope do not need to be included in the assessed risks within the MDCP.

An example of an activity envelope is provided in Figure 1, showing sensitive areas intentionally excluded.

Figure 1. Example an activity envelope where sensitive features have been intentionally excluded.



Amendment to an Approvals Statement

When an applicant is seeking an amendment to their existing mining operation, the MDCP needs to describe if the changes will alter the activity envelope as recorded on the existing Approvals Statement and where appropriate provide an updated activity envelope.

If no change is required, the MDCP should state there is no change to the existing approved activity envelope.

3.3 Site plan

The MDCP should include a site plan containing the following aspects:

- all proposed and existing activities;
- tenement boundaries and labels;
- a north indication;
- a legend or labelling of activities; and
- the activity envelope

The purpose of the site plan is to assist with an understanding of spatial/geographical context and key risks of the proposed mining activities and explain how the mining operation will be

laid out and function. The site plan should also be used to demonstrate location of proposed mining activities in relation to environmental sensitivities such as reserve boundaries, major topographical features, major water courses, conservation significant flora/fauna etc. Multiple plans can be provided to show detail at a sufficient scale.

It should be noted that the site plan is indicative and provided to assist with assessment only. As part of the risk assessment applicants should identify where buffers (where features can't be excluded from the activity envelope) are required for environmentally sensitive features or where limitations are required for the location of key mining activities (e.g., waste rock landforms not located within drainage lines) to minimise risks. Any buffers or location limitations required to minimise environmental risks should be specified in the activity details tables or environmental outcomes.

Amendment to an Approvals Statement

When an applicant is seeking an amendment to their existing mining operation, the site plan should be updated to clearly indicate the additional activities or changes proposed.

3.4 Activity details

The Activity Details section of a MDCP must records the activities for which approval is sought, and the maximum disturbance required. The scope and scale of the proposed activities forms the basis of approved activities recorded on an Approvals Statement and should be presented using the standard tables below.

The MDCP should include a written description of the proposed mining activities detailing any relevant construction, design and operational requirements.

Where appropriate the proposed activities in Table 1 should be defined using the categories presented in Schedule 1 of the Mining Rehabilitation Fund Regulation 2013.

Table 1. Total mining activity area

Tenement	Total activity area (ha)	Proposed Activities
M01/01	170 ha	TSF; Waste dump; Mining Void; Transport or service infrastructure corridor; Airstrip; Laydown or hardstand area; Building; Borrow Pit; Plant site;
M01/02	90ha	Waste dump; Mining Void
G01/03	10 ha	Borefield

Table 2. Mining activities details

Mining Activity Reference	Nature and extent of activity	Activity Area (maximum extent per tenement)
Mining Void A	Maximum 15 m depth Above groundwater table.	M01/01
		10 ha
		M01/02

		15 ha
Mining Void B	Maximum 40 m depth. Below groundwater table. Partial backfill to 20m BGL. No more than 50,000m ³ of lithology A (PAF) to be mined.	M01/01
		40 ha
TSF A	Paddock-style, 2 cells, perimeter discharge, max height of 15m. Constructed and operated in accordance with Design Report Y.	M01/01
		30 ha

The activity tables have been designed to allow the flexibility for applicants to detail the types of mining activities that will be undertaken on the tenements within the specified activity envelope and disturbance limits. For most mining activities the applicant is not required to individually list each activity and specify a disturbance area, allowing the mining operation to be adaptive and removing the requirement to seek approvals for minor changes. For most standard mining activities, outlining the proposed activity type (such as transport/infrastructure corridor, laydown, workshop and plants site) will be sufficient and applicants should ensure that the risk assessment appropriately captures all the risk associated with the types of activities proposed.

Applicants will be required to provide additional information for higher risk, more complex mining activities to ensure the risk of these activities are understood and appropriately managed. The mining activities DEMIRS considers to be of higher risk requiring additional details include:

- Tailings Storage Facility (TSF);
- waste dump or overburden stockpile;
- mining voids (above or below groundwater level)
- heap/vat leach facility; and
- any other highly engineered structure (e.g. seawall, evaporation ponds)

The nature and extent column of Table 2 provides applicants with the opportunity to identify any key design parameters or location limitations that will avoid or eliminate risk associated with high risk or complex mining activities. Examples of the type of information DEMIRS would expect to be captured for higher risk or more complex mining activities is provided in Table 2. The intent is for details relating to the nature and extent of higher risk/complex mining activities to be recorded on the Approvals Statement where appropriate. During assessment DEMIRS may also identify other relevant information regarding the nature and extent of the mining activities that may need to be recorded in the Approvals Statement.

Where the MDCP involves multiple landforms/complex/high risk mining features it may be useful for applicants to summarise key characteristic of each of the features, in a format similar to the table presented in Appendix 2.

Tenement Purpose

Under the Mining Act, a Miscellaneous Licence and/or a General Purpose Lease may be granted for specific purposes as applied for in the tenement application.

It is the tenement holder's responsibility to ensure mining activities proposed in the MDCP and recorded on the Approvals Statement align with the purpose for which the tenement was granted.

Where a MDCP includes Miscellaneous licence(s) or General Purpose lease(s) it is recommended the purpose for which the tenement was granted is detailed to demonstrate alignment with the activities proposed in the MDCP. This information may best be presented in table format.

Amendment to an Approvals Statement

When an applicant is seeking an amendment to their existing mining operation, the activity details table should detail the additional mining activities or changes required to existing activities recorded on the Approvals Statement.

3.5 Additional Information

Detailed design information

Detailed design information should be provided for all engineered landforms and structures where the design is essential to the proposed risk treatment for that landform/ structure. As a guide detailed design information should be provided for the following engineered landforms:

- Tailings Storage Facility (above ground or in-pit);
- significant surface water diversion structures;
- large water storage or evaporation ponds;
- vat leach cell or heap leach pad;
- co-disposal of dry stack tailings in waste rock landform; and
- other high risk engineered structures (e.g. sea walls, high risk encapsulation of radioactive waste)

Guidance on detailed design reports for TSFs can be found in the DEMIRS [Guide to the preparation of a design report for tailings storage facilities \(TSFs\) \(2015\)](#).

Closure Designs for key landforms

The MDCP should provide preliminary closure design concepts for any permanent landforms proposed. The design concepts should include but not limited to:

- Design parameters and justification for design

- Initial detail diagrams or cross sections
- Preliminary landscape drawings of the site showing drainage lines/features and flood modelling.

The closure designs presented at the project approval stage may be conceptual and refined and further developed in the subsequent reviews of the MCP. However, the level of information provided at any stage of the project should demonstrate key landforms can be successfully rehabilitated and closed to meet DEMIRS overarching objectives of safe, stable, non-polluting, and self-sustaining ecosystem meeting the agreed post mining land use.

Sterilisation Report

A MDCP should include a [sterilisation report](#) where resources are likely to be sterilised by infilling (either with waste rock or tailings material) a mining void. A sterilisation report is not required for shallow deposits such as mineral sands, bauxite or nickel laterite where resources are not likely to be sterilised.

4. Legislative framework

A MDCP must contain a table of all relevant environmental approvals or regulatory requirements that will affect the environmental management of the mining activities. As far as practicable, DEMIRS will not duplicate assessment of any component of an activity that also requires approval from another regulatory agency.

This information should be provided using the standard table presented below.

Table 3. Relevant environmental approvals and statutory requirements.

Environmental Factor	Risk pathway regulated	Relevant legislation	Relevant Approval Condition/outcome	Phase of mine life

For each approval or statutory requirement listed, the MDCP should identify the specific environmental factor(s) that will be regulated by the approval or statutory requirement and the phase of mine life the approval is related to. This will enable DEMIRS' assessment to focus on those factors that are not directly regulated by another agency or covered by another regulatory requirement.

Legislation that may be relevant includes:

- *Aboriginal Heritage Act 1978*
- *Biodiversity Conservation Act 2016*
- *Conservation and Land Management Act 1984*
- *Contaminated Sites Act 2003*

- *Country Areas Water Supply (CAWS) Act 1947*
- *Dangerous Goods Safety Act 2004*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Environmental Protection Act 1986*
- *Health Act 1911*
- *Heritage Act 2018*
- *Metropolitan Water Supply Sewerage and Drainage Act 1909*
- *Work Health and Safety Act 2020*
- *Native Title Act 1993*
- *Petroleum (Submerged Lands) Act 1982*
- *Petroleum and Geothermal Energy Resources Act 1967*
- *Petroleum Pipelines Act 1969*
- *Planning and Development Act 2005*
- *Rights in Water and Irrigation Act 1914*
- *State Agreement Acts*
- *Waterways Conservation Act 1976*

While DEMIRS' assessment will focus on environmental impacts not already regulated under other approvals or legislation, applicants are still required to include all activities in the Activity Details section to ensure Mining Act approval is obtained for the activity.

Where a risk pathway is directly regulated under another regulatory framework this should be clearly articulated in the 'legislative framework' section of the MDCP and does not need to be included in the risk assessment and outcomes sections. It is common for other regulatory processes to only partially regulate some aspects of mining activities or only regulate during certain phases of the mining (e.g., during operations), and may not be directly applicable in other phases such as mine closure or care and maintenance. In these circumstances, the specific aspects/mine life phases not regulated by other regulatory processes will need to be considered in the risk assessment and outcomes.

It should also be noted that in most circumstances DEMIRS is the lead regulator for mine rehabilitation and closure, therefore the baseline data and analysis section of the MDCP still needs to provide sufficient detail to demonstrate an understanding of rehabilitation and closure risks.

Amendment to an Approvals Statement

When an applicant is seeking an amendment to their existing mining operation, the legislative framework table should detail the relevant environmental approvals and statutory requirements that relate specifically to the additional mining activities or changes required.

4.1 Mining operations assessed under Part IV of the Environmental Protection Act 1986

For mining activities that have been approved or are being assessed under Part IV of the *Environmental Protection Act 1986*, the MDCP should outline the factors being assessed by the Environmental Protection Authority (EPA). Assessment of these factors will not need to be replicated in the MDCP. The proposed activities need to be within the spatial boundaries and scope of the EPA assessment for this to apply.

The information should be presented in a Table format similar to the example provided below.

Table 4. Risk pathways regulated under Part IV of the Environmental Protection Act 1986

Environmental Factor	Risk Pathway	Aspects regulated under Part IV EP Act (include ERD section reference and phases of mining)	Relevant Ministerial Condition (if known)	Link to baseline information (e.g. technical reports) relevant to MDCP

The MDCP will need to address environmental aspects not assessed under the Part IV process.

4.2 Mining operations requiring a Native Vegetation Clearing Permit under Part V of the Environmental Protection Act 1986

For mining activities that have been granted or will require a Native Vegetation Clearing Permit under Part V of the *Environmental Protection Act 1986*, it is considered that the environmental impacts related to direct removal of native vegetation are regulated through this process. NVCP approvals should be clearly detailed in the Legislative Framework section of the MDCP. The MDCP will need to consider risk pathways associated with any indirect impacts to biodiversity from the proposed mining activities that have not been applied for as clearing via a NVCP. This can include but is not limited to:

- Impacts to groundwater dependent vegetation from dewatering activities.
- Vehicle collisions with native fauna during operation, temporary suspension and rehabilitation phases.
- Impacts to flora and vegetation from dust emissions during operation, temporary suspension and rehabilitation phases.
- Ability to rehabilitate the mine area to return native vegetation comparable to the surrounding environment.
- Introduction and spread of weeds during operation, temporary suspension and rehabilitation phases.

4.3 Interaction with Aboriginal Heritage Act 1972

Where appropriate, the legislative framework section of the MDCP should identify the *Aboriginal Heritage Act 1972* as the relevant legislation under which impacts to Aboriginal cultural heritage is regulated. Where required, this section should detail the approvals/requirements under the *Aboriginal Heritage Act 1972* and the status of those approvals.

Identification of heritage matters is an important component of a MDCP as it informs matters such as post-mining land use and stakeholder engagement. Where the legislative framework identifies heritage matters relevant to the operation, DEMIRS would expect to see this

reflected in the stakeholder engagement strategy and (where relevant) the post-mining land use.

5. Baseline data and analysis

Site specific baseline environmental data is vital in identifying the environmental risks and potential impacts of proposed mining activities, informing the risk treatment measures and determining appropriate environmental outcomes. It provides an understanding of the environmental values and beneficial uses that may be affected by the proposed activities and establishes the environmental context in the risk management process.

Relevant baseline data should be summarised and interpreted in the MDCP document, with technical reports attached as appendices. Digital spatial datasets for baseline data (e.g. vegetation communities, vegetation types, dieback mapping) should be provided where available.

5.1 Environmental and social setting

The MDCP should include a written description of the overall context of the mining operation in relation to the environmental and social sensitivities within the activity envelope and surrounds.

This should include a description of:

- seasonal and climatic conditions;
- geomorphology;
- seismicity;
- historical and current land use and planning provisions;
- affected communities and social setting;
- heritage (including natural, cultural and historic); and
- any other potentially limiting factors for the mining operation (e.g. contaminated sites or reserve land)

This section should include a description of the current land use(s) in the area and demonstrate that all other approvals and/or consents required under the Mining Act due to tenement conditions or underlying land uses and infrastructure (e.g. consent for access to reserve, surface rights, avoidance of legislated buffers, etc) have been obtained.

Amendment to an Approvals Statement

When an applicant is seeking an amendment to their existing mining operation, the environmental and social setting section should be relevant to the proposed changes.

5.2 DEMIRS Environmental Factors

The MDCP should include a subheading for each of DEMIRS environmental factors:

- land and soils;
- water resources; and
- biodiversity.

Under each of these subheadings the following information should be provided:

- List of completed technical studies.
 - It is recommended this is presented in table format similar to the example below.
- Analysis of technical studies and implications for mining operations.
 - Analysis should include a description of key sensitivities identified and the operational implications/risk pathways.
- Analysis of technical studies and implications for rehabilitation and closure.
 - Analysis should include a description of matters relevant to closure of the mining operation (e.g. predicted long term environmental conditions and the considerations for long term landform design).

Table 5. Example Technical studies table.

Document Reference (including consultant/year)	Linked Appendix

Further guidance on the aspects to be considered for DEMIRS environmental factors is provided in Section 9 of this document.

Amendment to an Approvals Statement

When an applicant seeking an amendment to their existing mining operation, the baseline information presented on DEMIRS environmental factors should be relevant to the changes being proposed. If these changes are substantial amendments, then it may be necessary to undertake additional baseline studies and ensure this information is incorporated into the MDCP.

For minor amendments the baseline data and analysis section may simply state there is not additional baseline data required for this MDCP due to (provide explanation).

5.3 Land and soils

5.3.1 Soils

In regard to soil, a MDCP should include the following aspects:

- A description of the major soils occurring in the activity envelope including the indicative volume and characterisation of topsoil and subsoil available for rehabilitation.
- Where there are multiple soil types identified, a map showing the spatial extent of each identified soil type in the activity envelope. The map should include a scale bar, latitude and longitude coordinates, date of field survey, and regional map location.
- Soil characterisation to ensure the risk posed by adverse components can be determined.

- Potential for soil pathogens, such as dieback.

5.3.2 Subsurface materials and mining waste

Understanding the geochemical and physical characteristics of subsurface materials and mining waste is a critical component of mine planning. Material characterisation helps ensure that the environmental risk assessment is appropriately informed, aids in mine closure planning and assists in the cost-effective operation and closure of a mine. It also provides a basis for preventative management, appropriate use of materials and improved environmental outcomes. When done effectively, it can save on double handling and expensive remediation later in mine life.

Material sampling and testing should be undertaken to determine the geochemical and physical properties of the materials encountered during mining operations. The MDCP should include a description of the geology and mineralisation of the project area, along with mineralogy of dominant and important/problematic lithologies and demonstrate an understanding of the types and volumes of subsurface materials and mining waste that will be encountered over the life of mine.

The level of information provided should demonstrate that the applicant understands the characteristics of the materials to identify potential risk pathways. Where relevant, the MDCP should address the following risk factors associated with proposed mining activities:

- acidic and/or metalliferous drainage (AMD), (encompassing all metals/metalloids regardless of whether the conditions are acidic);
- saline materials and/or drainage;
- erosive, sodic and/or dispersive material;
- fibrous minerals;
- material with other chemical/physical properties that will affect stability or success of rehabilitation (e.g. low pH, low fertility, poor structural integrity, water holding capacity);
- naturally occurring radioactive material (NORM) and technologically enhanced naturally occurring radioactive materials (TENORM).

The MDCP should also include predicted volume and characteristics of tailings or any other processed waste.

It is recommended that indicative volumes and proportion of each mined material be presented in a table format similar to the example below:

Table 6. Example of how to present indicative volumes of mined material.

Material type	Modelled maximum quantity (m3)	Lithology breakdown (PAF/NAF/Dispersive)	Modelled Maximum Quantity (m3)
Soils (topsoil/subsoil)			
Waste rock			
Ore			

Processed waste (tailings)			

Materials characterisation studies should consider the following aspects:

Sampling

Material collected for analysis should be relevant to the area that will be mined. The samples taken should be relevant to depth and extent of the proposed open cut or underground activities.

The number of samples required for the geochemical work is specific to each project and will depend on the type of rock and waste units, tonnage of material disturbed, variation of critical geochemical properties in the material (first assessed once a number of samples have been analysed) and available information from previous studies at the site.

Enough samples should be collected to be able to determine the distribution of relevant geochemical properties in the rock and waste units. The MDCP should demonstrate that the sampling conducted is representative of the material to be mined/ disturbed. This may include a figure to show the spatial location of all samples in relation to the proposed area to be mined/disturbed.

For initial sampling and testing, and where no prior information is available, the below table from MEND (2009) can be used as a guide for sample selection:

Tonnage of unit (metric tonnes)	Minimum number of samples
<10,000	3
<100,000	8
<1,000,000	26
<10,000,000	80

Characterisation testing

Additional characterisation test work may be required to demonstrate an understanding of the environmental risks posed by any problematic materials. This may include the following critical tests to assess environmental impacts, specific waste management and closure restrictions:

- Emerson Test;
- Acid Base Accounting (ABA);
- Net acid generation;
- Geochemical Abundance Index (GAI); and

- Fibrous Leaching test.

The below Table 7 provides an example of how to present detailed materials characterisation results in the MDCP.

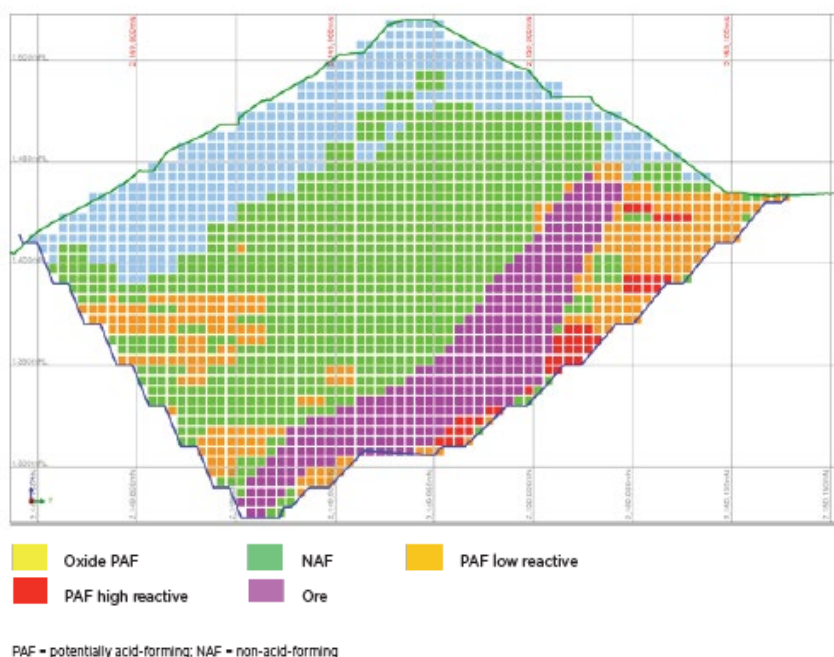
Table 7. Example of how to present detailed materials characterisation results.

Material	Lithology type	Total volume	N° of samples	% S	PAF/NAF classification	Leachable metals	Fibrous	Salinity/Emerson classification
Oxide								
Transitional								
Fresh								
Ore								
Tailings								

Block model

Where appropriate, a block model should be developed with relevant diagrams presented in the MDCP. The block model demonstrates to DEMIRS that the applicant understands the volume and location of each ore type to be mined. An example of a block model is presented in Figure 2.

Figure 2. Visual representation of an AMD block model – cross sections showing relationship of waste types to proposed open-pit shell (ore body shown in purple). Source: Australian Government Preventing Acid and Metalliferous Drainage handbook September 2016.



For more details regarding waste characterisation, including sampling and testing, please refer to the Australian [Government's Preventing Acid and Metalliferous Drainage – Leading Practice Handbook](#).

5.3.3 Rehabilitation material balance

The MDCP should provide details on the availability and indicative volumes of key materials required for rehabilitation such as competent waste rock, subsoil, topsoil and low permeability clays (i.e. encapsulation material) as well as detail on the volumes required to complete rehabilitation (i.e. material balance). This is to demonstrate that there are sufficient volumes of material available to achieve the closure outcomes proposed. Where a shortfall of material is identified the MDCP should detail the mitigation measures to be implemented to address the deficiency (i.e. trialling alternative cover material, etc).

5.4 Water resources

5.4.1 Surface water

In regard to surface water, a MDCP should include the following aspects:

- Catchment area(s) and where appropriate, a map identifying the activity envelope in relation to the catchment(s).
- Surface hydrology of the activity envelope and potentially affected downstream environment (e.g. ephemeral creeks, permanent creeks/streams, playa lakes, wetlands, water holes).
- Environmental values and beneficial uses of surface water.

- Surface water management areas intersected or impacted by proposed activities.
- Surface water quality characteristics including salinity and pH.
- Flooding characteristics of the area. Where flooding presents a risk to the environmental management of the mining operation (including post-closure) flood modelling and mapping should be provided.

5.4.2 Groundwater

In regard to groundwater, a MDCP should include the following aspects:

- Regional and local hydrogeology and groundwater dynamics (flow directions, relative pressures/levels, interconnection, quality, recharge zones and size).
- Environmental values (e.g. groundwater dependent ecosystems) and beneficial uses of groundwater in the area.
- Groundwater management areas intersected or impacted by proposed activities.
- Groundwater quality characteristics of the groundwater resources. The characterisation of pre-existing conditions needs to be adequate to enable the detection of any impacts from mining activities. For mining operations with minimal interaction with groundwater, or where risks are considered negligible to low, the characterisation can be limited to broad indicators (e.g. salinity and pH). Where there is a moderate risk, the characterisation should be more detailed and focus on the nature of the risks (e.g. if acid and/or metalliferous drainage is a risk then baseline levels of relevant anions and cations may be appropriate).

Where groundwater will be intercepted by the operation, the following information should also be provided:

- Map of the inferred groundwater resources.
- Water quality and pressure, recharge areas, aquitards, aquifer details, water gradient (include seasonal fluctuations if known), flow directions and rates, discharge areas for each aquifer potentially affected by mining activities.
- Description of the interconnectivity between the ore body, water supply aquifers, dewatered aquifers and lateral, overlying and underlying aquifers and surface water.

For further guidance refer to the Australian and New Zealand Guidelines Water Quality Management Framework and Guidelines and the Department of Water and Environmental Regulation's Water Quality Protection Guidelines No. 1-11 for Mining and Mineral Processing.

5.5 Biodiversity

Biodiversity baseline data is required to understand the pre-existing assemblages, diversity, condition and ecological function of flora, fauna and ecosystem(s) at the species, population and community level.

Where there are likely to be species or communities of conservation significance, or where land managed for the purposes of conservation may be directly or indirectly impacted,

applicants are encouraged to engage with the Department of Biodiversity, Conservation and Attractions (DBCA) for specific advice on information collection and interpretation.

A MDCP should include the following matters relevant to biodiversity:

- A description of the pre-existing biodiversity/flora/fauna/ecosystem values of the area affected by the proposed mining activities, including identification of any species or communities of conservation significance (e.g. listed species/ communities under state or commonwealth legislations, including listed weed/introduced species).
- Surveys supporting the identification of pre-existing biodiversity values. The level of survey(s) can range from desktop to detailed field surveys. Guidance on undertaking an appropriate survey of flora and fauna values is found within the Environmental Protection Authority (EPA) Guidelines and Technical Guidance, in particular:
 - EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (2016)
 - EPA Technical Guidance – Terrestrial Fauna Surveys (2016)
- Maps illustrating the existing vegetation communities and habitat descriptions and the location and extent of any sensitive values or threats (endemic or introduced). It is suggested that the maps include an overlay of the site plan and activity envelope.

Short Range Endemic (SRE) species can be particularly important to consider as part of the baseline fauna surveys as they have the potential to be spatially restricted on a small scale and are generally at a greater risk of changes in conservation status, local or taxon extinctions than other more widely distributed species. The MDCP should identify whether SRE species and/or subterranean fauna are likely to be present within the activity envelope and, where required, demonstrate that relevant field surveys have been conducted. Further guidance on likely habitats for SRE and subterranean fauna, and appropriate sampling techniques, can be found within the EPA's Technical Guidance:

- EPA Technical Guidance – Sampling of Short Range Endemic Invertebrate Fauna (2016).
- EPA Technical Guidance – Subterranean Fauna Survey (2016).
- EPA Technical Guidance – Sampling methods for Subterranean Fauna Survey (2016).

Any surveys undertaken should comply with the relevant EPA Technical Guidance.

6. Stakeholder engagement

Community expectations around the level and detail of stakeholder engagement undertaken by mining companies have increased over time and Environmental Social Governance (ESG) has become a primary driver in managing risks and opportunities for mining operations. Given this, the MDCP must:

- Describe the approach to ongoing stakeholder engagement.
- Identify all relevant stakeholders with an interest in the proposal.

- Demonstrate that effective and appropriate engagement has been undertaken leading up to the submission of the proposal.

The level of engagement required will depend on the classification of stakeholders, as detailed below and should be tailored to the group being targeted.

Stakeholder Classification:

Key stakeholders	Stakeholders
Directly impacted groups – including underlying landholders, government agencies administering reserves and decision-making authorities, Traditional Owner groups, post-mining landowners / managers, etc	Groups that require engagement but do not have a direct involvement in the operation – Other government agencies, surrounding landholders, Local Shire / authorities, community groups, Landcare groups etc.

When Traditional Owners have been identified as key stakeholders the MDCP must demonstrate that they have been actively engaged regarding the proposed mining activities. The MDCP should demonstrate that they have had an opportunity to comment and demonstrate how comments have been considered as part of the development of the MDCP.

Details of key stakeholders and a record of the engagement undertaken should be presented in a stakeholder engagement register, similar to the example provided below. Stakeholder engagement can be summarised in the MDCP however, a detailed register should still be provided as an attachment. Depending on the quality and effectiveness of stakeholder engagement information provided, DEMIRS may contact stakeholders to verify statements made in the register.

Table 8. Stakeholder engagement register.

Stakeholder Engagement Register					
Date of each Engagement	Description of Engagement	Stakeholders (Include name and/or titles)	Stakeholder comments/issue (Reference)	Applicant Response and/or resolution	Stakeholder Response
03/03/2023	Quarterly meeting	Traditional owners: (Mr J. Smith) (Mrs O. Jones) Applicant: (Operations Manager) (Communities Manager)	Concerns regarding impacts to water quality and quantity in a nearby spring (Minutes shown in Appendix xx)	Monitoring quality and quantity of the spring water to be undertaken throughout the life of mine. Traditional owners kept informed of results.	Acceptable
21/06/2023	Meeting to discuss potential post-mining land uses	Pastoralist neighbour: (Mr S. Thomas) Applicant: (Environment Manager)	Concerns about any hole or pit to be left behind after mining (Minutes shown in Appendix xx).	Will include in closure design and provision practical measures to make safe (to humans and animals) any hole or pit left after mining	Acceptable

Often the most intensive level of engagement with stakeholders is undertaken by companies at the approvals stage; however, meaningful engagement should be carried out at all stages

of an operation. A guide to DEMIRS' expectations for stakeholder engagement, based on stage of mining, are set out in Table 6 below.

Table 9. DEMIRS expectations for stakeholder engagement.

Stage of Mining	DEMIRS Expectations	Level of engagement required	Level of information required
Investigations/ pre-mining	<ul style="list-style-type: none"> • Identification of stakeholders (key vs other) • Develop a stakeholder engagement plan • Post-Mining Land Use identified 	<ul style="list-style-type: none"> • Contact regarding land access, introduction to proposed activities • Develop and present the proposed post-mining land use to key stakeholders / land managers 	<ul style="list-style-type: none"> • Records of meetings, discussions, times, dates and stakeholders in a stakeholder register • Follow up of any queries or concerns, with the resolution or close out documented
Operations	<ul style="list-style-type: none"> • Post mining land use discussed and agreed with key stakeholders • Closure outcomes and completion criteria developed to support the post-mining land use 	<ul style="list-style-type: none"> • Regular scheduled engagement as per the stakeholder engagement plan, or as required • Refinement of post-mining land use, where indicated 	<ul style="list-style-type: none"> • Records of all engagement relevant to closure, with issues / topics discussed, times and dates, who attended, and what the outcomes of the engagement were • Stakeholder register updated • Records of any issues / topics that require follow-up or clarification
Decommissioning and Closure Execution	<ul style="list-style-type: none"> • Works undertaken in accordance with Mine Closure Plan to support achievement of closure outcomes, completion criteria and post-mining land use 	<ul style="list-style-type: none"> • Regular updates showing progress with decommissioning and closure tasks • Regular updates detailing tracking towards meeting closure outcomes/ completion criteria, with any proposed adjustments discussed 	
Post Closure Monitoring and Maintenance	<ul style="list-style-type: none"> • Monitoring and maintenance as per the Mine Closure Plan 		
Relinquishment	<ul style="list-style-type: none"> • Gain sign off for post-mining transfer of assets, or relinquishment 	<ul style="list-style-type: none"> • Signed agreements for handover of assets 	<ul style="list-style-type: none"> • Copies of signed agreements, any documentation pertaining to handover of assets

Amendment to an Approvals Statement

When an applicant is seeking an amendment to their existing mining operation, the MDCP must clearly detail the stakeholder engagement that has been undertaken in relation to the changes being proposed. If these changes are substantial amendments, it may be necessary to include greater detail on the engagement undertaken and stakeholder responses.

If the amendments are minor in nature the stakeholder engagement section may simply state no update to stakeholder engagement for this MDCP due to (provide explanation).

7. Post mining land use

The MDCP must present the proposed post mining land use and demonstrate how the post mining land use selected is:

- Relevant to the environment in which the mine will operate or is operating.
- Achievable in the context of post-mining land capability.

- Acceptable to key stakeholders.
- Ecologically sustainable in the context of the local and regional environment

Should an alternative post-mining land use not be defined/agreed with key stakeholders at the point of submission, it is DEMIRS' expectation that land will be returned to the pre-mining land use.

Amendment to an Approvals Statement

When an applicant seeking an amendment to their existing mining operation the MDCP should present the current land use(s) in the area impacted by the changes. The MDCP must also identify if the amendment will result in a change to the post-mining land use recorded on the existing Approvals Statement. The applicant must clearly demonstrate engagement with key stakeholders relating to the proposed changes.

If no changes are proposed, then the post-mining land use section should simply state "there is no change to the post mining land use due to.

8. Risk Assessment and Management

DEMIRS requires that an environmental risk assessment is undertaken for the proposed mining activities using the risk assessment framework presented in Appendix 3.

The risk assessment should cover all relevant risk pathways affecting DEMIRS environmental factors, across all phases of mine life for the activities proposed in the MDCP.

Risk pathways do not need to be included in the risk assessment where:

- It is clearly demonstrated in the Legislative Framework section of the MDCP that a risk pathway is directly regulated by another agency or covered by another regulatory requirement across all phases of the mine life.
- The activity envelope excludes an area of land with a particular sensitivity, resulting in the elimination of a risk pathway for direct impact to that sensitivity. Depending on the buffer size, it is possible for the location of the activity envelope to also eliminate indirect risk pathways.
- A proposed activity has been limited through detail provided in the MDCP to eliminate or avoid a risk pathway, for all phases of mine life (including periods of suspension of operations). For example, a depth limit of a pit above the natural variation of the groundwater table may eliminate some risk pathways relation to contamination of groundwater.

The risk assessment should:

- Identify all the risk pathways and potential environmental impacts affecting DEMIRS environmental factors across all stages of the mine life.
- Evaluate the risk to derive an inherent risk rating, prior to the application of treatments.
- Identify appropriate risk management treatments using hierarchy of control.
- Re-evaluate the risk pathways to derive a residual risk rating.
- Demonstrate that all residual risks are managed to as low as reasonably possible (ALARP) and consistent with DEMIRS environmental objectives.

The outcome of the risk assessment should be recorded in the risk register presented in Appendix 3 and included in the MDCP. The risk register has been designed to assist in identifying the appropriate environmental and closure outcomes required to ensure DEMIRS environmental objectives can be met. The risk register should identify for each risk pathway:

- the appropriate, relevant DEMIRS standard environmental and/or closure outcome; and/or
- if a site-specific outcome is required.

Section 9 provides further detail regarding Environmental and Closure Outcomes, including DEMIRS standard outcomes.

8.1 Risk Treatments

The risk treatment information provided should demonstrate that all risk pathways will be managed to ALARP, and that any residual risks will not impact DEMIRS' key environmental objectives.

The level of information in a MDCP in relation to risk treatments should be proportionate to the level of inherent risk, with higher inherent risks, or those with a long lag time between risk control and impact having a greater level of detail.

As detailed risk treatment information is often difficult to display within a risk register, when a MDCP includes high or above inherent risk pathways or risk pathways associated with long lag risks, it may be of benefit to include a written description of these risk treatments in addition to the risk register. This may include detail of any internal monitoring, reporting or indicators that will be used to determine if the treatments are working.

Amendment to an Approvals Statement

When an applicant is seeking an amendment to their existing mining operation, the risk assessment should focus on risk pathways associated with the changes being proposed. If these changes are substantial, the applicant should undertake a thorough risk assessment to ensure all relevant risk pathways are identified and can be appropriately managed. If the amendments are minor in nature and changes can be managed by the existing outcomes, the Risk Assessment section should simply state there are no additional risk pathways (provide explanation).

9. Environmental and closure outcomes

The purpose of environmental outcomes is to establish the acceptable level of impact that must not be exceeded, or the level of protection/performance that must be achieved, for the site to be compliant throughout all phases of the mine life.

The purpose of closure outcomes is to establish the results that must be achieved at the end of the mine life to demonstrate that the land has been successfully rehabilitated and is able to support the agreed post mining land use(s).

Under the MDCP framework, DEMIRS will consider the environmental outcomes identified within a MDCP when setting conditions of approval. These conditions, including both standard and site-specific outcomes, will be recorded on the Approvals Statement.

9.1 Standard environmental and closure outcomes

DEMIRS has developed a list of standard environmental and closure outcomes (presented in Appendix 4) that are intended to ensure mining activities proposed in a MDCP meet DEMIRS' key environmental objectives for each environmental factor. These standard outcomes have been developed with consideration of DEMIRS Environmental Objectives Policy for Mining (see section 1.1).

9.2 Site specific outcomes

For many mining operations, DEMIRS standard environmental and closure outcomes will be adequate to document the outcome that will be achieved. However, in some situations, the MDCP may need to include site specific outcomes to demonstrate the achievement of DEMIRS environmental objectives. It is expected site specific outcomes may be needed in situations where the required outcome is not covered by the Standard environmental or closure outcomes, for example:

- The mining activities proposed involve unusual or unique risk pathways.
- The applicant believes the DEMIRS standard outcomes are not applicable or appropriate and wishes to propose an alternative outcome with sufficient justification.

In general, site-specific outcomes should still be written to allow adaptive and flexible environmental risk management and can be typically expressed as either:

- an impact that must be avoided;
- a level of impact that must not be exceeded; or
- a level of protection to be achieved.

Prescriptive or management-based outcomes may be required where there is:

- an inability to define level of impact acceptable;
- limited baseline information or uncertainty on the likely impact of the mining activities;
or
- the environmental risk requires a high degree of management /ongoing studies.

9.3 Completion criteria

Completion criteria are required to be detailed in association with the Closure outcomes stated in the MDCP. Completion criteria are necessary to demonstrate the success of rehabilitation and mine closure and the achievements of closure outcomes. Criteria should be developed in consultation with key stakeholders including DEMIRS and should be appropriate to the phase of the project. Completion criteria should follow the S.M.A.R.T principle and be:

- **Specific** enough to reflect a unique set of environmental, social and economic circumstances.
- **Measurable** to demonstrate that rehabilitation is trending towards analogue indices.
- **Achievable** or **realistic** so that the criteria being measured are attainable.
- **Relevant** to the outcomes that are being measured and the risks being managed and flexible enough to adapt to changing circumstances without compromising outcomes.

- **Time-bound** so that the criteria can be monitored over an appropriate time frame to ensure the results are robust for ultimate closure completion.

Development of completion criteria should commence upfront at the project approval stage and be reviewed and refined in MCP revisions throughout the mine life to respond to monitoring, research and trial information and any other information or change as appropriate.

For further guidance on developing completion criteria refer to the Western Australian Biodiversity Science Institute's (WABSI), [A framework for developing mine-site completion criteria in Western Australia \(WABSI, 2019\)](#).

As outlined in Section 8 (Risk Assessment and Management), a MDCP should specify an outcome (either standard or site specific) for each risk pathway in the MDCP risk assessment.

The Environmental and Closure Outcomes section of the MDCP must include:

- The Environmental Outcomes (both standard and site specific) identified via the risk assessment with details of the proposed monitoring to demonstrate compliance with the outcomes. It is recommended this information be presented in table format (Table 10).
- The Closure Outcomes (both standard and site specific) identified via the risk assessment with details of the proposed completion criteria and monitoring to demonstrate compliance with the outcomes. It is recommended this information be presented in table format (Table 11).

Table 10. Table detailing the environmental outcomes that will be achieved along with the details of the monitoring program.

DEMIRS objective	Risk pathway	Environmental Outcome	Monitoring (method and frequency)

Table 11. Table detailing the closure outcomes that will be achieved along with the associated completion criteria and monitoring.

#	Closure outcome	Domain	Risk Pathway	Completion Criteria	Performance indicator (if required)	Monitoring

Amendment to an Approvals Statement

When an applicant is seeking an amendment to their existing mining operation, the MDCP should articulate if the changes will result in a change to the environmental and closure outcomes recorded on the existing Approvals Statement.

If no changes are proposed, then the environmental and closure outcomes section should justify why there is no change to the environmental outcomes.

10. Monitoring

Monitoring is required to demonstrate that environmental outcomes and conditions are being met. Regular monitoring is required against the established baseline data and/or reference sites throughout the mine life to demonstrate compliance with approval conditions stated on the Approvals Statement. Monitoring of areas undergoing rehabilitation is required to demonstrate progress towards achieving closure outcomes and completion criteria.

The MDCP must include details of the minimum monitoring frequency and monitoring methodology to demonstrate the achievement of the environmental and closure outcomes.

The monitoring frequency should be informed by the site risk assessment, with greater inherent risks having a higher frequency of monitoring. The particular risk pathways within a MDCP may also inform monitoring frequency (for example some risk pathways may only need monitoring after specific climatic events).

Monitoring against achievement of the environmental outcomes and conditions recorded on an Approvals Statement is expected to be reported to the DEMIRS within the Annual Environmental Report.

The tenement holder is responsible for monitoring environmental performance and continually improving or adapting their management to prevent or limit environmental impacts. It is recommended that an internal monitoring program with action trigger points be established. These triggers should aim to provide an early warning system that allow for additional management measures or contingency plans to be implemented before any conditions recorded on an Approvals Statement are breached.

11. Closure implementation

Details on how the proposed mining activities will be rehabilitated and closed is required in the MDCP to ensure closure has been appropriately considered at the mining approval stage and demonstrate that DEMIRS environmental objectives for mine rehabilitation and closure can be met. The closure implementation section must include:

- an indicative closure work schedule for achieving closure outcomes;
- identified knowledge gaps and schedule for addressing them; and
- contingencies for early closure or suspension of operations.

Domain model

A useful approach to mine closure planning and implementation is to divide up the closure work and segregate the operation into specific areas or domains. Each domain is treated as

a separate entity within an overall plan and includes landforms or infrastructures with similar rehabilitation, decommissioning and closure requirements/outcomes. Examples of domains at a mine are:

- ore processing area;
- infrastructure;
- tailings storage facilities;
- waste landforms;
- roads/airstrips;
- borefields/pipelines/powerlines/infrastructure corridors;
- process and raw water facilities; and open voids and declines/shafts.

For accuracy, it is recommended that the mining operation uses Geographical Information System (GIS) digital terrain models and aerial photographs to illustrate the domain features and boundaries. 3D models may be useful for waste landforms, voids, tailings dams and other structures.

The domain model provides a good focal point for developing strategies for closure implementation and helps to facilitate structured risk assessment and management. However, closure planning and implementation should also consider the whole of landscape scale to ensure effective integration of final land uses.

Short life of mine

The level of detail required in the closure Implementation section will depend on the complexity of the proposed mining activities and the life of mine. For mining operations with a short life of mine (projected mine life of two years or less) there is limited ability to refine mine closure planning and address any key knowledge gaps.

A MDCP for a mining operation with a short life of mine should include a greater level of detail to demonstrate that closure outcomes can be achieved. This may include:

- detailed closure work schedule with clear timeframe for completion;
- well defined knowledge gaps with clear actions to ensure they are addressed prior to closure; and
- detailed closure designs for permanent landforms.

For further detail on mine closure planning refer to Guidance – How to prepare mine closure plans in Western Australia available on the DEMIRS website.

Amendment to an Approvals Statement

When an applicant is seeking an amendment to their existing mining operation, the MDCP should detail the closure implementation that relates specifically to the additional mining activities or changes required.

11.1 Closure work schedule

A closure implementation work schedule is important to demonstrate that progressive closure has been considered, even at the project approval stage. Depending on the life of mine, the

closure work schedule developed at the project approval stage may contain broadly identified tasks and an indicative timeframe that will be refined or expanded in the subsequent reviews of the mine closure plan. For a short life of mine project, the closure implementation section should be more detailed with specific timeframes.

It is recommended the closure work schedule include a closure task register similar to the example shown below.

Table 12. Example of a closure task register.

CLOSURE TASK REGISTER					
Closure and rehabilitation tasks during operations					
#	Domain	Works to be undertaken including Outcomes	Responsible Role / Owner	Timing	Status
1	Pits	Rehabilitate WRD 666	Mining Manager	2023	In progress
2	Pits	Trial on ripping depth	Mining Manager	2022	Complete Trial plot established, monitoring commenced
3	WRD	Monitoring of Ripping Depth Trial	Environment Manager	2026	In progress
4	Pit xxx	Establish Abandonment Bund	Mining Manager	2023	Complete, except haul road access points
5	Pit 123	Backfill to surface	Mining Manager	2028	Backfilling with waste from Pit xxx
Closure & Rehabilitation Tasks During Decommissioning/Closure					
#	Domain	Works to be undertaken including Outcomes	Responsible Role / Owner	Timing	Status
1	Plant	Demolition of Process Plant	Closure Manager	2028	
2	Plant	Contaminated Sites – Preliminary Site Investigation	Closure Manager	2029	
Closure & Rehabilitation Tasks Post Closure					
#	Domain	Works to be undertaken including Outcomes	Responsible Role / Owner	Timing	Status
1	Pit xxx	Finalise Abandonment Bund -Close haul road access points	Mining Manager	2029	

When using the domain model approach, it may be useful to capture the following detail for each closure domain as text, tables, or appendices as part of the closure work schedule:

- Description of domain or feature - including area of disturbance, status of rehabilitation and estimated closure date.
- Applicable land use, closure outcomes, completion criteria, and/or performance indicators for each domain and/or feature.
- A schedule of work for research, investigation and trials tasks – showing key tasks and key milestones and approximate timing required for each task.
- A schedule of work for progressive rehabilitation tasks – showing key tasks and key milestones and approximate timing required for each task.
- Identification and management of information gaps, including review of monitoring data and other closure data.
- Key tasks for premature closure.
- Decommissioning tasks – including management of contaminated sites.
- A schedule of work for performance monitoring and maintenance tasks.

The level of information provided at any stage of the project should demonstrate that closure requirements have been appropriately identified and can be achieved with the expected life of mine.

Progressive Rehabilitation

The closure work schedule should incorporate progressive rehabilitation and stage the treatment of disturbed areas during the life of the mining operation and ensure areas are rehabilitated as they become available rather than undertaking large scale rehabilitation works at the completion of the mining operation. Progressive rehabilitation has many benefits, including:

- reduced financial liability under the Mine Rehabilitation Fund (MRF);
- demonstration of responsible closure commitment to the community and regulators by reducing the unrehabilitated “footprint” of the mine; and
- costs of rehabilitation are managed throughout the life of the mine.

Mine planning and engineering decision-making processes should optimise opportunities for progressive rehabilitation consistent with the post-mining land use(s) and closure outcomes.

Progressive rehabilitation activities need to be fully integrated into the day-to-day mining operations to ensure materials and resources are available to undertake the work required.

11.2 Knowledge gaps

The MDCP should detail the knowledge gaps identified at the approvals stage, the actions needed to close the gap and ownership and a schedule for action completion. It is recommended the knowledge gaps are presented in a table format as shown below.

Table 13. Example of a knowledge gap register.

Knowledge Gap Register						
#	Section of the MCP	Knowledge Gap	Planned Action	Action Owner Title / Role	Timing for Completion	Progress
1	Baseline data	Results of monitoring to date not known	a. Summarise monitoring data to date	Environment Advisor	December 2022	Complete
			b. Assess the implications for closure from the monitoring results	Environment Manager	December 2023	
2	Contaminated sites	Extent of contamination around the old Pit ABC fuel facility	Undertake a Contaminated Sites Preliminary Site Investigation at Pit ABC fuel facility area	Environment Manager	August 2023	Complete
3	PAF	Unknown quantity and location of PAF material in WRD 6	Drilling of WRD6 to identify locations and estimate the volumes of PAF materials	Mining Manager	December 2023	
4	Materials balance	Topsoil and alternative growth materials volumes unknown	Materials surveyed for inclusion in site-wide materials balance	Technical Services – Senior Surveyor	January 2024	
5	Contaminated sites	Removal of contamination around the old Pit ABC fuel facility	Arrange for Contaminated materials at Pit ABC fuel facility area to be excavated and placed in the bio-remediation area	Mining Manager	November 2023	

The knowledge gap register developed at the project approval stage may contain broadly identified tasks and an indicative timeframe that will be refined or expanded in the subsequent reviews of the MCP. The level of information provided at any stage of the project should demonstrate that potential knowledge gaps have been appropriately identified, with adequate lead time allowed to investigate and close the gaps.

11.3 Early closure or suspension of operations

Although practical planning for premature closure (permanent or suspended operations under care and maintenance) may not be very detailed in the early stages of the project, consideration should be given in the MDCP to how closure scenarios that may arise from economic, environmental, safety or other external pressures will be dealt with. In particular, this should include confirmation that appropriate materials are available on site and contingencies are provided to make landforms such as tailings storage facilities and waste landforms secure, stable and non-polluting / non-contaminating.

In such an event, implementation of an accelerated closure process will need to occur. Tenement holders should contact the relevant Environmental Officers at DEMIRS to advise of any accelerated closure.

The MDCP should detail the activities to be undertaken in the event of early closure or suspension of operations, these may include:

- ongoing environmental management activities (weeds, feral animal, water management, waste management, rehabilitation monitoring, etc);
- site security and access management;
- maintenance and monitoring for high-risk landforms (e.g. tailings storage, heap leach, contaminant ponds, Open Pits, PAF waste, etc);
- de-energising and isolation of inactive electrical systems, safe storage of chemicals;
- de-gassing and purging of pipelines and storage tanks containing hazardous materials, problematic materials to ensure operational or emergency response readiness;
- removal of excess chemicals, fuels, explosives, and other potentially contaminating HAZMAT, or dangerous goods from site; and
- making the site safe from inadvertent public access.

Applicants need to be aware that under the *Work Health and Safety Act 2020* they are required to notify the DEMIRS Directorate inspector of mines of the suspension of a mining operation. There are template documents available on the DEMIRS webpage for commencement, suspension, recommencement and abandonment.

APPENDICES

Appendix 1	MDCP Scoping document template
Appendix 2	Example Landform Summary Table
Appendix 3	DEMIRS Environmental Risk Assessment Framework
Appendix 4	DEMIRS Standard environmental and closure outcomes

Appendix 1 – MDCP Scoping Document template

The purpose of a Mining Development and Closure Proposal Scoping Document is to:

- provide a framework for pre-consultation with DEMIRS to discuss the key aspects of the Mining Development and Closure Proposal;
- delineate regulatory agency responsibilities; and
- identify issues that are to be addressed prior to submission of the mining proposal and/or required studies/work that need to be carried out.

A blank template is available on the DEMIRS website for potential applicants to complete to ensure necessary information is available or information gaps identified prior to meeting with DEMIRS. This document is provided for further guidance to applicants intending to submit Mining Development and Closure Proposal and is not a document for approval.

1. Key proposal characteristics¹

Summary of proposal

Proposal title²	[Emily Gold Mine]
Applicant name	[Safe Hands Mining Pty Ltd]
Short description	[This proposal is to mine ore from Emily deposit, 25 km north of the town of Coolgardie WA, including the construction of associated mine infrastructure (plant, offices, workshop, accommodation and roads), construct a waste rock landform and discharge waste to a Tailings Storage Facility]

Physical elements

Activity Type/ Element	Location	Proposed nature/extent
Mining void	[Tenements, Attached Figure]	[Up to 1 ha in surface disturbance, up to 80m depth, Underground, Above ground water]
Waste dump or overburden stockpile	[Tenements, Attached Figure]	[Up to 60 ha in area. Max height of 35m. Potential for acid-forming material.]
Tailings or residue storage facility	[Tenements, Attached Figure]	[Up to 25 ha in area. Paddock-style, 2 cells, perimeter discharge, max height of 15m. Up-stream lifts as per Design Report. Potential for acid-forming material and high levels of lead.]
Heap or vat leach facility	[Tenements, Attached Figure]	[Up to 10 ha in area, max height of 3m as per Design Report]
Evaporation Pond	[Tenements, Attached Figure]	[Up to 180 ha in area, max height of 3m as per Design Report]
Miscellaneous mine activities	[Tenements, Attached Figure]	[Up to 100 ha in area. Includes fuel storage facility, workshop, landfill, accommodation village, airstrip, laydown area.]

¹ This table is aligned with the EPA's *Instructions on how to define the key characteristics of a proposal*. You can copy the table across from any existing EPA assessment documents.

² If the project has been assessed by the EPA, use the same project name as that stated in the 'Key Proposal Characteristics Table' included in the EPA assessment documents.

Operational elements³

Element	Location	Proposed nature/extent
Dewatering	[Tenements, Attached Figure]	[Pit dewatering up to 0.5 GL per year on MXX/01 and LXX0/01. Temporary storage in lined Dam and then used for processing and dust suppression. No discharge to environment.]
Ore processing	[Attached Figure]	[Up to 500,000 tonnes of ore processed per year]
Ore processing (waste)	[Attached Figure]	[Up to 300,000 tonnes of tailings produced per year, physical and engineering characteristics of tailings]

1. Consideration of environmental factors and scope of work

The purpose of this section is to discuss how the project will impact on DEMIRS' environmental factors,⁴ and what further work will be undertaken.

Environmental Factors	Studies undertaken/proposed	Comments
Land and soil	[Physical and chemical characterisation of waste] [Soils survey] [Erosion modelling]	[Topsoil and subsoils are nutrient poor, and can be dispersive, however suitable as rehabilitation material if used appropriately.] [Lateritic materials suitable as rehabilitation material. Competent fresh rock available for TSF construction and rock armouring. Oxide zone wastes present risks to rehabilitation – erodible and dispersive.] [Approx. 8% of waste rock is potentially acid forming (PAF). Tailings has PAF material but should be adequately buffered by the net neutralising capacity of the tailings.] [Erosion modelling to be completed to predict levels of erosion from waste rock landform and tailings embankments.]
Biodiversity	[Level 2 flora and fauna surveys, stygofauna survey.]	[Two priority flora species identified - <i>Acacia westerosii</i> , <i>Eucalyptus pawneus</i>] [Threatened fauna habitat present, Impacts to <i>Leipoa ocellata</i> (Malleefowl) and <i>Liopholis kintorei</i> (Great Desert Skink).in targeted surveys.] [~10% of Very Important TEC to be impacted by proposal] [Stygofauna survey still to be completed]

³ Include any operational elements that are not clearly explained by the list of physical elements.

⁴ As defined in DEMIRS *Environmental Objectives Policy for Mining* (2020).

Environmental Factors	Studies undertaken/proposed	Comments
Water resources	[Hydrogeological study] [Hydrological study – surface] [Flood mapping]	[Pit dewatering up to 0.5 GL per year required. Groundwater is saline – 30,000mg/l TDS] [Dan's Creek realignment.] 1 in 100 year ARI flood mapping to be undertaken.]
Rehabilitation and mine closure	[Closure designs] [Rehabilitation trials]	[TSF closure design – store and release cover. Waste rock landform closure design – bench and berm, 14 degree slopes, contain drainage on top surface and berms, combined topsoil/rock mulch.] [Rehabilitation trials proposed.]

2. Stakeholder engagement

The purpose of this section is to outline what targeted stakeholder engagement has been undertaken, what further engagement is proposed, and how this has affected the proposal.

Stakeholder engagement to date indicates the post-mining land use will be: [insert land use e.g. pastoral, conservation]

De Mining - Stakeholder Engagement Register					
Date	Description of Engagement	Stakeholders	Stakeholder comments/issue	Applicant Response and/or resolution	Stakeholder Response
2019 - ongoing	[Quarterly meetings]	[Traditional owners]	[Concern that water in a nearby spring may be being contaminated with lead]	[Identifying and securing lead contaminated materials. Monitoring quality and quantity of the spring water. Remedial action as required. Health testing and keeping the traditional owners informed]	[Acceptable]
12 July 2023	[Meeting to discuss potential post-mining land uses]	[Pastoralist neighbour]	[Concerns about any hole or pit to be left behind after mining]	[Will include in closure design and provision practical measures to make safe (to human and animal) any hole or pit left after mining]	[Acceptable]
2020 - 2023	[Periodic meetings to discuss post-mining opportunities]	[Local Shire]	[No concerns with new proposed activities. Seeking ongoing relationship with regular communication to explore potential uses of rehabilitated mine feature or infrastructure to be left after]	[Continued open dialogue]	[N/A]

De Mining - Stakeholder Engagement Register					
			mining that would be of benefit to community]		
12 June 2024	[Pre-referral consultation]	[DWER – EPA Service]	[Confirmed that Section 45C required]	[Prepared and lodged 30 June 2024]	[Under Review]

3. Legislative framework

The purpose of this section is to outline what other environmental approvals (or other relevant approvals) have been granted or will be applicable, and what aspects of the proposal they will regulate.

Environmental Factor	Risk Pathway Regulated	Relevant Legislation	Relevant approval condition/outcome (if known)	Phase of mine life

4. Attachments

Attachment 1 – Regional location

Attachment 2 – Proposed site plan

Attachment 3 – Proposed activity envelope

Appendix 2 – Example landform summary table

Where the MDCP involves multiple landforms/complex/high risk mining features it may be useful for applicants to summarise key characteristic of each of the features as per the example table below. This is to assist with assessment and not indicate the information recorded on the Approvals Statement.

Mining activity			
Mining activity reference			
Material characteristics	Fibrous and/or Radioactive	Yes No	Details (if present):
i.e. Materials intercepted within mining voids	Materials capable of generating acid and/or metalliferous drainage, including neutral drainage and saline drainage.	Yes No	Details (if present):
i.e. Materials contained within all other features	Dispersive and/or erosive material that is capable of compromising the structure and stability of the activity.	Yes No	Details (if present):
Design description i.e. Commitments to operate within			
Maximum height and/or Depth			
Geotechnical design report (if required)			

Appendix 3 – DEMIRS environmental risk assessment framework

To ensure the environmental risks associated with the proposed mining activities are appropriately identified and managed, an environmental risk assessment must be undertaken using DEMIRS standardised framework. This risk assessment framework is further described below.

The risk assessment must identify all environmental pathways affecting DEMIRS' environmental factors across all phases of mine life and that may arise from emergency conditions. DEMIRS' environmental factors are established in (link to objectives policy).

The framework should be utilised in consideration of the terminology and definitions presented in Table 1.

The risk assessment process includes the following steps:

1. Risk identification.
2. Risk analysis.
3. Risk Evaluation.
4. Risk Treatments.
5. Risk Register.

The relevant aspects of each of these steps is detailed below.

Step 1. Risk identification

Risk identification involves a systematic listing of risk pathways based on the project scope, activities and relevant environmental values. To appropriately identify risks, DEMIRS requests the description of the risk pathway is separated into three components:

- unwanted event;
- cause of the risk; and
- description of the impact.

Risk pathways which are not identified cannot be managed, therefore considered effort is required at this step of the process. To assist in this, DEMIRS recommends applicants:

- Seek advice from experienced operators, specialists and relevant regulatory agencies.
- Research and incorporate learnings from previous environmental incidents that have occurred from similar activities around Australia and internationally.

Risk identification requires adequate and appropriate baseline data, without which the risk pathways or potential impacts may not be identified. As detailed in the Baseline Data and Analysis section of this document, applicants are required to undertake surveys and studies to meet all relevant industry standards to minimise limitations of the baseline data. Following collection of the baseline data detailed analysis is required to establish what the key environmental sensitivities and how these might be impacts by the proposed activities.

An example of how to appropriately identify risk pathways and potential impacts is provided in Table 2.

Table 2. Example of how to describe risk pathway.

Unwanted event	Cause of risk	Description of Impact
Erosion of highly dispersive mined materials into the surrounding environment.	Poor place placement of mined material during operations	Smothering of native vegetation impacting on vegetation health.
Generation of acidic of metalliferous drainage.	Exposure of mined materials to water and air during operations	Soil contamination

Step 2. Risk analysis

The risk level is analysed by determining both the consequence and likelihood of each risk pathway, firstly for the inherent (untreated) risk and then for the residual (treated) risk.

The risk pathway should be analysed to determine the most plausible consequence of the risk event based on DEMIRS standard consequence descriptors (Table 3). Descriptors have been developed to link directly to DEMIRS environmental factors.

The risk pathway should be analysed to determine the most plausible likelihood of the risk event occurring based on DEMIRS standard likelihood descriptors (Table 4). The descriptors have been developed to capture operational and closure timescales. Where a risk pathway is related to rehabilitation and closure it may be more appropriate to consider the closure timescale.

Based on the consequence and likelihood the risk level of the risk pathway must be determined using DEMIRS standard risk matrix (Table 5).

Each risk pathway may have multiple impacts and can affect more than one environmental factor. An example of how this can be present in the risk register is provided in Table 6.

The risk analysis should be undertaken considering the limitations of the data and information used, where data is incomplete or absent, the uncertainty of an impact increases. Any uncertainty should be reflected in a higher inherent risk. In most cases an MDCP cannot be adequately assessed if baseline data is deemed inadequate, however where knowledge gaps cannot be reasonably filled prior to commencement of a mining operation applicants should demonstrate the application of the precautionary principle, to minimise the potential for environmental harm.

Step 3. Risk evaluation

Risk evaluation involves determining whether the inherent risk and the residual risk is acceptable in the context of DEMIRS' environmental objectives. Where risks are not acceptable, appropriate treatments should be determined using the hierarchy of control: eliminate, avoid, minimise or mitigate.

Generally, even a risk pathway with a low inherent risk level will require the industry best practice environmental management applied.

Where risk evaluation determines a risk pathway and its potential impact(s) are not acceptable (inherent extreme risk), the applicant is required to undertake further studies or investigate alternative options. The outcomes of this work would require revision of the risk analysis step for the relevant risk pathway.

Step 4. Risk Treatment

The MDCP should document all proposed risk treatments for each risk pathway. The proposed effectiveness of treatments must be analysed (using DEMIRS standard framework) to determine the residual risk level and ensure the principle of As Low as Reasonably Practicable (ALARP) is met.

The selection of treatments should demonstrate the preferential application of the hierarchy of control:

1. Where reasonably practicable, **eliminate or avoid** the risk, by not undertaking the risky activity. For example, changing the project layout to avoid clearing of threatened flora or changing pit designs to avoid disturbance of potentially acid forming material.
2. Reduce the risk by **substituting** a different activity which poses a lower risk. For example, backfilling a pit void with mine waste instead of constructing a waste rock dump.
3. **Control** the risk with an engineered solution. For example, having a specifically designed adverse materials management cell in a waste dump, or the use of automatic (instead of manual) shut-off valves.
4. **Mitigate** the risk using administrative procedures. For example, reducing speeds on mine roads, daily checks of a TSF or warning signals/signs.

Applicants may specify design parameters or location limitation in their activity details tables which eliminate or avoid the risk for specific mining activity. In these circumstances applicants may choose to remove the risk pathway from the risk assessment. Risk treatments which avoid a sensitive area or substitute a lower risk activity will result in reduction of both the consequence level and likelihood level.

Treatments which rely on control or mitigation of the risk should not be considered as the first option, as failure of the treatment is likely to result in environmental harm. Applying these risk treatments will result in a reduction of the likelihood level.

The higher the inherent risk of an unwanted event, the more reliable and robust the selected risk treatments are required to be.

A low inherent risk generally requires less detail of the selected risk treatments, especially if these treatments utilise existing industry standards or codes, however, these standards need to be stated.

Where an inherent risk of medium or high requires specific management measures, the MDCP should contain a comprehensive description of the proposed treatments e.g. encapsulation plan for potentially acid forming materials and associated diagrams of the encapsulation cell. This information may not fit within the risk register table and may need to be provided in the body of the document or as an appendix; however, the key management points are required to be summarised within the risk register table.

When considering which treatments require documented plans (which would form part of the environmental management system), applicants should consider both “high-frequency low-consequence” events, as well as “low-frequency high-consequence” events.

Step 5. Risk register

The risk assessment should be presented in DEMIRS standard risk register presented in Table 6. A copy of the risk register should be included with the MDCP. The register should be used to summarise all risk pathway identified for all phases of mine life and demonstrate how risks these can be adequately managed to as low as reasonably practicable.

As Low As Reasonably Practicable (ALARP)

ALARP is defined as any measure which is practicable and the implementation cost (money, time, effort) is not grossly disproportionate to the benefit, the measure is considered “reasonably practicable” and implementation is expected. The criterion is not “reasonably affordable”; justifiable cost, time and effort is not determined by the financial constraints or viability of the project.

In the selection of risk treatments, the MDCP should demonstrate that all residual risks are ALARP and will not impact DEMIRS’ key environmental objectives. In some instances, established and/or standard industry practices and procedures may meet the ALARP principle, however, in other instances more stringent risk treatments will be required.

Reducing a risk to ALARP involves a balance between the cost (money, time, effort) and the resultant risk reduction. This level represents the point at which the cost required for further reduction measures becomes unreasonably disproportionate to the additional risk reduction obtained.

Justification for selection of risk treatments, and how they reduce the risk to ALARP, may include details of other options which upon evaluation were rejected, as the costs were grossly disproportionate to the benefit. It should be noted that, over time, costs associated with some risk treatments may reduce, therefore, treatments that were initially grossly disproportionate to the benefit may become reasonably practicable.

Just as risks alter over time, so too do treatment options; therefore, applicants are required to continually review and improve environmental management to maintain residual risks at an ALARP level. The establishment and maintenance of an environmental management system (EMS) is one method applicants can use to embed continuous improvement.

Environmental standards, codes and guidance

In circumstances where Australian Standards, code of practices and other established guidelines exist, these can be referenced in the risk treatment section where applicable.

Where there are no relevant standards or the risk is new or emerging, proposed management strategies are required to be more detailed to provide confidence to the department that the applicant understands the risk and has demonstrated that appropriate treatment can be implemented.

Table 1. Definitions of commonly used phrases and descriptors used within the risk assessment framework.

Term	Definition
Activity Envelope	The spatial extent within which the mining activities will be located.
ALARP	Any measure which is practicable and the implementation cost (money, time, effort) is not grossly disproportionate to the benefit, the measure is considered “reasonably practicable” and implementation is expected.
Category/aspect	The element of the activity that can interact with the environment to cause an impact.
Closure period	The period after rehabilitation and closure works have been completed.
Consequence	The scale and type of effect of the potential impact on the environmental factor.
Conservation significant vegetation	Vegetation with significant conservation value within a physical environment.
Contaminated	Contaminated, in relation to land, water or a site, means having a substance present in or on that land, water or site at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value.
Ecosystem	A biological system composed of all the organisms found in a particular physical environment, interacting with it and with each other.
Environmental factor	A part of the environment that may be impacted by an activity.
Environmental objective	The related environmental objective for each environmental factor is the desired goal that, if met, will indicate that the proposed activities are not expected to have a significant impact on that factor of the environment. DEMIRS objectives are identified in the Environmental Objectives Policy for Mining (2020).
Environmental outcome	Environmental outcome is the acceptable level of impact that must not be exceeded, or a level of protection/performance/result that must be achieved, for the mine site to be considered compliant.
Environmental value	A beneficial use and/or an ecosystem health condition.
Geotechnical stability	Refers to the condition where the rates of change of parameters specific to geotechnical properties meet agreed criteria.
Geochemical stability	Refers to the condition where the rates of change of parameters specific to geochemical properties meet agreed criteria.
Groundwater	Water held underground in the soil or in pores and crevices in rock.
Habitat	The area and resources used by a particular fauna species.
Level of risk	Magnitude of a risk or combination of risks, expressed in terms of the combination of consequence and likelihood.
Likelihood	The probability of an activity impacting on an environmental factor to produce the predicted consequence.
Impact	Interaction of an aspect of an activity with an environmental factor.

Inherent risk	The risk before any risk treatments are applied.
Introduced fauna	Non-native fauna species
Knowledge gap	The difference between what an operator knows versus what the regulator requires them to know.
Life of mine	Expected duration of mining and processing operations.
Localised/local	The activity envelope plus adjacent study areas associated with the mining operation.
Phase of mine life	These phases include yet to commence, construction, operation, care and maintenance, active, rehabilitation and closure.
Permanent	Irreversible changes to environment caused by the mining operation.
Pollutant	A substance that results in contamination of the environment, especially soil, water or atmosphere.
Post mining land use	Term used to describe a land use that occurs after the cessation of mining operations.
Rehabilitation	The return of disturbed land to a safe, stable, non-polluting/non-contaminating landform in an ecologically sustainable manner that is productive and/or self-sustaining consistent with the agreed post-mining land use.
Recoverable impact	Impact that can be rectified to be consistent with prior environmental conditions.
Receptor	A biophysical entity which may be impacted by an aspect of the mining operation.
Regional	The broader terrestrial area within which the mining operation occurs.
Residual risk	The risk remaining after risk treatment.
Risk	The chance of something happening that will have an impact on objectives. It is measured in terms of consequences, and their likelihood of occurrence.
Risk analysis	Process to comprehend the nature of risk and to determine the level of risk.
Risk assessment framework	Set of components that provide the foundations and organizational arrangements for undertaking risk assessments including risk identification, risk analysis, risk evaluation and risk treatment.
Risk identification	Process of finding, recognising and describing risks.
Risk management	Coordinated activities to direct and control an organisation with regard to risk.
Risk treatment	Process to modify risk.
Source of risk	Source of potential harm, or situation.
Stable	A condition where the rates of change of specified parameters meet agreed criteria.
Surface water	Water that collects on the surface of the ground. May be pooled on the surface or composed lakes, creeks, and rivers.

Unwanted event	A situation or condition where there is a loss of control of the hazard that leads to harm.
Weeds	Plants that establish and persist in a natural ecosystem where they did not previously exist. Weeds may, or may not, have detectable environmental or economic impact.
Widespread	More widespread than the activity envelope and adjacent study areas.

Table 3. DEMIRS risk assessment framework Consequence Descriptors

Objectives and Environmental Factors		Environmental Indicator	Category Label				
Environmental Factor	Objective		1 (Insignificant)	2 (Minor)	3 (Moderate)	4 (Major)	5 (Severe)
Biodiversity	To maintain representation, diversity, viability, and ecological function at the species, population and community level.	Ecosystem function	Alteration to an isolated area within the activity envelope with no effect on habitat or ecosystem.	Localised alteration or disturbance to a habitat or ecosystem resulting in a recoverable impact within 5 years.	Alteration or disturbance to a habitat or ecosystem resulting in a recoverable impact within 10 years.	Alteration or disturbance to a habitat or ecosystem resulting in a recoverable impact within 25 years.	Alteration or disturbance to a habitat or ecosystem resulting in a potentially non-recoverable impact.
		Flora and vegetation	No direct loss of vegetation within the activity envelope although increased stress may be incurred through indirect or induced pressures.	Localised and short-term (<5 years) loss of vegetation which is widely distributed outside of the activity envelope.	Localised medium-term (5-10 years) loss of vegetation which is widely distributed outside of the activity envelope. Project places minimal pressure on continued survival of conservation significant vegetation on a local scale.	Localised and long-term (> 10 years) loss of vegetation, a large portion of which is confined to the activity envelope. Project places significant pressure on continued survival of conservation significant vegetation on a regional scale.	Permanent loss of vegetation outside of the activity envelope, causing significant pressure or extinction of conservation significant vegetation on a regional scale.
		Fauna	Localised and short term (< 5 years) decrease in fauna habitat and or/fauna abundance occurring within the activity envelope.	Localised and medium-term (5-10 years) decrease in fauna habitat and/or fauna abundance occurring within the activity envelope.	Localised and irreversible or widespread and long term (> 10 years) decrease in fauna habitat and/or fauna abundance within the activity envelope.	Significant, widespread, and persistent regional decrease in fauna habitat and/or fauna abundance.	Permanent regional loss of fauna habitat and/or loss of conservation significant fauna habitat and/or conservation significant fauna population.
		Environmental threats (weeds, pathogens and introduced fauna)	Manageable, localised infestation/spread within the activity envelope that does not result in competition/impact with native species.	Manageable, localised infestation/spread that results in minor competition/impact with native species.	Localised infestation/spread that results in competition/impact with native species requiring considerable management/control measures.	Regional infestation/spread that results in competition/impact with native species requiring extensive management/control measures.	Uncontrollable regional infestation/spread that results in competition/impact with native species and regional loss of vegetation communities or flora.
Water Resources	To maintain the hydrological regimes, quality and quantity of groundwater and surface water to the extent that existing and potential uses including ecosystem maintenance are protected.	Surface water quality	Incidental, short-term changes to local surface water quality that negatively impacts environmental values. Recoverable within 1 year.	Minor change to surface water quality that negatively impacts environmental values within the activity envelope.	Moderate change to surface water quality that negatively impacts environmental values within the activity envelope and downstream watercourses in the short-term (> 5 years).	Decline in surface water quality that negatively impacts environmental values in the activity envelope and downstream watercourses in the medium-term (5-10 years).	Decline in surface water quality that negatively impacts environmental values on a regional scale. Non-recoverable impact.
		Surface water quantity	Incidental, short-term changes to local surface water volumes. Recoverable within 1 year and/or negligible impact to	Minor, medium-term changes to local surface water volumes. Recoverable within 5 years and/or localised	Short to medium-term changes to regional surface water volumes. Recoverable within 10 years and/or negative	Medium-term changes to regional surface water volumes. Recoverable within 25 years and/or negative	Project causes permanent modifications to regional surface water volumes. Non-recoverable impact/permanent impact

			environmental values or water users.	impact to environmental values or water users.	impact to environmental values or water users.	impact to environmental values or water users.	to environmental values or water users.
		Ground water quality	Incidental, short-term changes to local groundwater quality that negatively impacts environmental values. Recoverable within 1 year.	Short-term (<5 years) localised decline in groundwater quality that negatively impacts environmental values.	Medium-term (5-10 years) localised decline in groundwater quality that negatively impacts environmental values.	Short to medium-term (5-10 years) regional decline in groundwater quality that negatively impacts environmental values.	Long-term regional decline in groundwater quality that negatively impacts environmental values. Non-recoverable impact.
		Ground water quantity	Incidental changes to local groundwater levels/availability. Recoverable within 1 year and/or negligible impact to environmental values or water users.	Local changes to groundwater levels/availability. Recoverable within 5 years and/or localised impact to environmental values or water users.	Local changes to groundwater levels/availability in the short to medium-term. Recoverable within 10 years and/or negative impact to environmental values or water users.	Regional changes to groundwater levels/availability in the medium-term. Recoverable within 25 years and/or negative impact to environmental values or water users.	Regional changes to groundwater levels/availability in the long-term. Non-recoverable impact permanent impact to environmental values or water users.
Land and soils	To maintain the quality of land and soil so that the environmental values are protected.	Soil resources	Incidental loss of soil resources has short-term impact on associated environmental values within activity envelope.	Loss of soil resources has medium-term impact on associated environmental values on a local scale.	Loss of soil resources has long-term impact on associated environmental values on a local scale.	Loss of soil resources resulting in a short to medium-term impact on associated environmental values on a regional scale.	Loss of soil resources that has a permanent impact on associated environmental values on a regional scale.
		Land contamination	Incidental land contamination within activity envelope, easily treatable in short-term (<1 week) and does not result in adverse impacts on associated environmental values.	Land contamination localised and treatable in medium-term (<1 year) and does not result in adverse impacts on associated environmental values.	Localised land contamination that is able to be rectified by operational personnel within 5 years and results in adverse impacts on associated environmental values in the short to medium-term.	Land contamination on a regional scale (beyond activity envelope) resulting in adverse impacts on associated environmental values. Results in clean-up requiring specialist remediation within 10 years and/or medium to long-term management.	Land contamination on a regional scale (beyond activity envelope) resulting in permanent damage with severe environmental and socioeconomic disruption. Results in clean-up requiring specialist remediation >10 years, or permanent residual impact.
Rehabilitation and mine closure	Mining activities are rehabilitated and closed in a manner to make them physically safe to humans and animals, geotechnically stable, geochemically non-polluting/non-contaminating, and capable of sustaining an agreed post-mining land use, and without unacceptable liability to the State.	Landscape	Closed/rehabilitated site is virtually indistinguishable from surrounding landscape and topography.	Closed/rehabilitated site integrates seamlessly with surrounding landscape and topography whereby it is not easily noticeable from a distance.	Closed/rehabilitated site integrates with surrounding landscape and topography, however mining-produced landforms or disturbances are distinguishable from a distance.	Closed/rehabilitated site has some features/landforms that do not integrate readily with the surrounding landscape and topography, however, only compromises local landscape values.	Closed/rehabilitated site has features/landforms that do not integrate readily with the surrounding landscape and topography, which compromises regional landscape values.
		Physical safety (to humans and animals)	Rehabilitated areas are physically safe to humans and animals.	Site is safe and any safety issues are contained and require no residual management.	Site is safe and any safety issues require minor, ongoing maintenance by the operator.	Site is unsafe and requires long-term management or intervention (i.e. <25 years).	Site is unsafe and will cause an ongoing residual effect (i.e. 25+ years).

	Post mining land use	Post-mining land use can be easily achieved and sustained without any liability to the State. Post-mining land use is acceptable to key stakeholders.	Post-mining land use can be achieved with minimal management required.	Post-mining land use cannot be sustained without some management.	Post-mining land use cannot be sustained without ongoing management.	Post-mining land use cannot be sustained. Post-mining land use is not acceptable to key stakeholders.
	Physical and geotechnical stability	Site is stable. Post-mining landforms are demonstrated to be physically stable with only incidental erosion.	Post-mining landforms are stable, but may experience minor erosion, such as riling.	Post-mining landforms are generally stable, but may experience moderate erosion, such as limited gullyng.	Post-mining landforms are unstable, with significant erosion, such as tunnelling and gullyng, and subsidence.	Post-mining landforms are likely to fail (e.g. TSF embankment failure), with extensive ongoing management issues.
	Geochemical stability	Post-mining landforms are geochemically stable and are proven to be non-polluting/non-contaminating.	Post-mining landforms are geochemically stable but may discharge minor amounts of pollutants to groundwater and surface water on a seasonal basis that does not result in contamination.	Post-mining landforms are generally stable but may discharge moderate levels of pollutants to groundwater and surface water that does not result in contamination.	Post-mining landforms discharge pollutants to groundwater and surface water causing short to medium-term (< 10 years) contamination.	Post-mining landforms discharge pollutants to groundwater and surface water causing long-term (> 10 years) to permanent contamination.

Table 4. DEMIRS Risk Assessment Framework Likelihood Descriptors

Descriptor	Operations		Closure	
	Frequency	Description	Probability	Description
Almost certain	Once, or more per year	The risk event is expected to occur in most circumstances. High number of known incidents across industry.	>90%	Likely to occur/commence within a 1 year period from closure commencement. AND/OR Occurs 5 to 10 times in 2 years.
Likely	Once in 5 years	The risk event is expected to occur in some common circumstances. Regular incidents known across industry.	70-90%	Likely to occur/commence within a 1-5 year period from closure commencement. AND/OR Occurs 5 to 10 years in 10 years.
Possible	Once in 10 years	The risk event might occur in some circumstances. Incidents known across industry	30-70%	Likely to occur/commence within a 5-20 year period from closure commencement. AND/OR Occurs 5 to 10 years in 20 years.
Unlikely	Once in 25 years	The risk event could occur in some uncommon circumstances, as this is known to occur at comparable sites. Some occurrences known across industry.	5-30%	Likely to occur/commence within a 20-50 year period from closure commencement. AND/OR Occurs 5 to 10 years in 50 years.
Rare	Once in 100 years	Highly unlikely, but the risk event may occur in exceptional circumstances, as may have occurred at comparable sites. Very few or no known occurrences across industry.	<5%	Likely to occur/commence within a 100 year period from closure commencement. AND/OR Occurs 1 to 5 years in 300 years.

Table 5. DEMIRS Risk Assessment Framework Risk Matrix

Risk Matrix		Most Credible Consequence Level				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood	Almost certain	Medium	High	High	Extreme	Extreme
	Likely	Medium	Medium	High	Extreme	Extreme
	Possible	Low	Medium	Medium	High	Extreme
	Unlikely	Low	Low	Medium	High	High
	Rare	Low	Low	Medium	Medium	High

Table 6. DEMIRS Risk Register

Risk ID Number	Key Environmental Factor	Category Aspect(s)	Domain	Description of Risk Pathway			Phase(s) of mine life	Inherent Risk			Risk Treatment	Residual Risk			Environmental or closure outcomes	Comments
				Unwanted event	Cause of risk	Description of Impact		Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating		
1	Biodiversity	Flora and vegetation	Waste dump	Generation of acidic of metalliferous drainage.	Exposure of mined materials to water and air during operations	Acid runoff entering surrounding environment and reducing vegetation health.	Operations Care and maintenance Closure	Moderate	Likely	High	PAF management plan implemented: During operations mined waste material with 0.2% sulfur identified and placed within PAF cell in centre of waste dump. Material covered with minimum 5m of NAF material.	Moderate	Rare	Medium	L1.0 Mined/processed materials managed to ensure any seepage and drainage is contained/controlled so that environmental values are protected.	Comprehensive waste characterisation studies completed to identify PAF material. High level of confidence.
2	Water resources	Surface water	Waste dump	Generation of acidic of metalliferous drainage.	Exposure of mined materials to water and air during operations	Acid runoff entering creek line and reducing surface water quality	Operations Care and maintenance Closure	Major	Likely	Extreme	PAF management plan implemented: During operations mined waste material with 0.2% sulfur identified and placed within PAF cell in centre of waste dump . Material covered with minimum 5m of NAF material.	Major	Rare	Medium	L1.0 Mined/processed materials managed to ensure any seepage and drainage is contained/controlled so that environmental values are protected.	Comprehensive waste characterisation studies completed to identify PAF material. High level of confidence.
3	Land and soils	Land contamination	Waste dump	Generation of acidic of metalliferous drainage.	Exposure of mined materials to water and air during operations	Acid run contaminating the soil and preventing successful rehabilitation.	Operations Care and maintenance Closure	Major	Likely	High	PAF management plan implemented: During operations mined waste material with 0.2% sulfur identified and placed within PAF cell in centre of waste dump. Material covered with minimum 5m of NAF material.	Major	Rare	Medium	L1.0 Mined/processed materials managed to ensure any seepage and drainage is contained/controlled so that environmental values are protected.	Comprehensive waste characterisation studies completed to identify PAF material. High level of confidence.

Appendix 4 – DEMIRS standard environmental and closure outcomes

DEMIRS standard environmental and closure outcomes that should be adopted where the relevant risk pathway exists.

Environmental Factor	Objective	Category/Aspect	ID #	Draft DEMIRS Standard Outcomes
Land and soils	To maintain the quality of land and soils so that environmental values are protected.	Land contamination	L1.0	Mined/processed materials managed to ensure any seepage and drainage is contained/controlled so that environmental values are protected.
			L2.0	All environmentally hazardous chemicals, rubbish and materials are removed from site or stored in a manner that prevents detrimental impacts to the surrounding environment.
		Mined materials	L3.0	Mined/processed materials managed to be safe and geotechnically stable.
		Soil resources	L4.0	Mining activities are managed to prevent erosion and sedimentation having detrimental impacts to the surrounding environment.
			L5.0	Mining activities managed to prevent the inundation of soil.
			L6.0	All suitable topsoil and other growth medium or rehabilitation resources being harvested, preserved and maintained for use in rehabilitation.
Water resources	To maintain the hydrological regimes, quality and quantity of groundwater and surface water to the	Surface water	W1.0	No contamination of surface water as a result of mining activities.
			W2.0	Hydrological and ecological function of surface water features are managed to prevent detrimental impact upon

	extent that existing and potential uses, including ecosystem maintenance, are protected.			the surrounding environment and/or land uses.
		<i>Groundwater</i>	W3.0	No contamination of groundwater as a result of mining activities.
			W4.0	Groundwater levels are managed to prevent detrimental impact upon the surrounding environment and/or land uses.
Biodiversity	To maintain representation, diversity, viability and ecological function at the species, population and community level.	<i>Flora and vegetation</i>	B1.0	Mining activities undertaken in a manner that prevent all direct and indirect impacts to native vegetation outside of the activity envelope.
			B2.0	Mining activities undertaken in a manner that minimises all direct and indirect impacts to vegetation inside of the activity envelope.
		<i>Fauna</i>	B3.0	Mining activities undertaken in a manner that prevent all direct and indirect impacts to native fauna outside of the activity envelope
			B4.0	Prevention of avoidable death or injury to native fauna from mining related activities.
		<i>Environmental threats (weeds and pathogens)</i>	B5.0	No increase in the diversity, distribution, and population of weed species and pathogens within the tenement(s) or surrounding land, as a result of mining activities.
		<i>Environmental threats (introduced Animals)</i>	B6.0	No increase in the diversity or population of introduced animal species within the tenement(s) or surrounding land, as a result of mining activities.
Rehabilitation and mine closure	Mining activities are rehabilitated and closed in a	<i>Physical and geotechnical stability</i>	C1.0	Constructed landforms are physically and geotechnically stable, to minimise erosion and to

<p>manner to make them physically safe to humans and animals, geotechnically stable, geochemically non-polluting/non-contaminating, and capable of sustaining an agreed post-mining land use, and without unacceptable liability to the State.</p>			support revegetation and/or the post mining land use.
		C2.0	The placement of mined materials/infrastructure in relation to excavations will be such that the final footprint after rehabilitation is not located within the pit zone of instability.
	<i>Landforms</i>	C3.0	Constructed landforms will consider visual amenity and local topography.
	<i>Geochemical stability</i>	C4.0	Constructed landforms are geochemically stable and will not cause pollution or contamination.
	<i>Land contamination</i>	C5.0	All contaminating materials have been removed, treated or managed in a manner consistent with the final land use requirements.
	<i>Surface water</i>	C6.0	Surface drainage patterns, flows and characteristics are reinstated and are consistent with the regional drainage function and/or post mining land use.
	<i>Groundwater</i>	C7.0	Pit lakes will not adversely affect the surrounding environment or other water resources and/or are consistent with the post-mining land use.
		C8.0	Groundwater levels and characteristics reflect original levels and characteristics and/or support the target ecosystem and post-mining land use.
	<i>Flora and vegetation</i>	C10.0	Rehabilitated land is consistent with agreed reference vegetation

			communities and/or with the post-mining land use.
		<i>Fauna</i>	C11.0 Rehabilitated areas provide habitat for native fauna, indicative of the target ecosystem and post-mining land use.
		<i>Ecosystem function</i>	C12.0 The rehabilitated ecosystem has function and resilience indicative of the target ecosystem and post-mining land use.
		<i>Physical safety</i>	C13.0 The disturbed mining environment is made safe to humans and animals.
			C14.0 All underground workings are managed and closed to ensure long-term ground stability and prevent ground subsidence
		<i>Infrastructure</i>	C15.0 No infrastructure left on site unless agreed to post-mining land managers/owners.

Government of Western Australia

**Department of Energy, Mines, Industry Regulation
and Safety**

8.30am – 4.30pm

Mineral House, 100 Plain Street
East Perth, Western Australia 6004
Tel: +61 8 9222 3333
Fax: +61 8 9222 3862

Online

Website: www.dmirs.wa.gov.au
Email: REC.Consultation@dmirs.wa.gov.au

Mailing address

Locked Bag 100
East Perth WA 6892

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