GOVERNMENT OF WESTERN AUSTRALIA

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

Guideline

Guideline for preparing Mining Development and Closure Proposals

December 2024

Document Hierarchy

Legislation	*Mining Act 1978* Mining Regulations 1981
Policy	Environmental Regulatory Strategy Environmental Objectives Policy for Mining Small Mining Operations Policy
Guidelines	This document
Procedures	Environmental Application Administrative Procedures Mining Development and Closure Proposal and Approvals Statement Framework

Version History

Version	Date	Changes
0.1	2024	*Draft guidance released for stakeholder consultation*
1.0	2024	*Formal publication of MDCP guideline. Revised from initial draft released based on consultation feedback.*

Contents

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:

- MDCPs submitted to DEMIRS meet the requirements set out in the Mining Act and Regulations.
- The proposed activities can achieve DEMIRS' environmental objectives.
- 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.
- MDCPs received are high quality and provide sufficient detail on relevant factors.
- Requests for further information to the applicant are minimised.
- There is transparency on DEMIRS' expectations for resource sector environmental management for the mining industry and community.

Scope

This document relates to the MDCP 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.

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 MDCP 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.

Guideline for preparing mining development and closure proposals

The content requirements of a MDCP are set out in the Mining Act and Regulations. A glossary of definitions and acronyms is provided in Appendix 1. Subheadings titled "Amendments to an Approvals Statement" have been provided for each section of the guideline. These subheadings (also consolidated in Appendix 2) provide specific guidance on the information DEMIRS would expect to be presented in the MDCP when seeking an amendment to an existing Approvals Statement.

A number of standard tables are included to guide applicants on the information to be presented in an MDCP. It is recommended applicants use the standard tables to ensure all relevant information is included and maximise efficiency and consistency of assessment.

A dedicated policy and form to support applicants lodging MDCPs for small mining operations is available on the DEMIRS website.

1. Description of proposed mining operation

1.1 Mining operation description

The MDCP must include a written description of the proposed mining operation including the location, the intended mine life and how the mine will operate and close.

Amendment to an Approvals Statement

When seeking an amendment to mining activities recorded on an Approvals Statement, the 'mining operation description' section should be updated as required to capture any new or modified mining activities, including how this changes the mining operation location, expected life of mine and closure of the site. It is recommended the applicant also clearly identify the new mining activities or changes to the activities for which approval is being sought.

1.2 Activity envelope

The MDCP must define the spatial extent within which the mining activities will be located (an activity envelope), including any activities below the surface of the land (e.g. extent of underground mining activities). Applicants will be required to upload a spatial file of the activity envelope via the Resources Online submission portal. The MDCP should also include the activity envelope as a figure 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 (see section 1.4) – anywhere within the area designated, provided all environmental outcomes and conditions are met. The need for further approval through a MDCP will be triggered when changes are proposed to the extent and/or location of the activity envelope.

Assessment of the MDCP will consider the likely environmental impact(s) and risks of the proposed mining activities within the extent of the activity envelope, as well as closure and rehabilitation of these activities. The risk assessment will need to identify the potential direct and indirect environmental impacts of all activities proposed in the MDCP and mitigate against those identified impacts. For this reason, applicants will need to ensure environmental information provided in a MDCP considers the entire activity envelope. As an example, an environmental survey may need to cover the entire activity envelope area to ensure all environmental values that may be impacted or require protection are appropriately identified. Environmental surveys and associated analysis may also need to consider the surrounding environment beyond the activity envelope to ensure any indirect and cumulative impacts are understood.

All land tenure 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 Part III Division 2 consent, consent conditions, etc.) have been met.

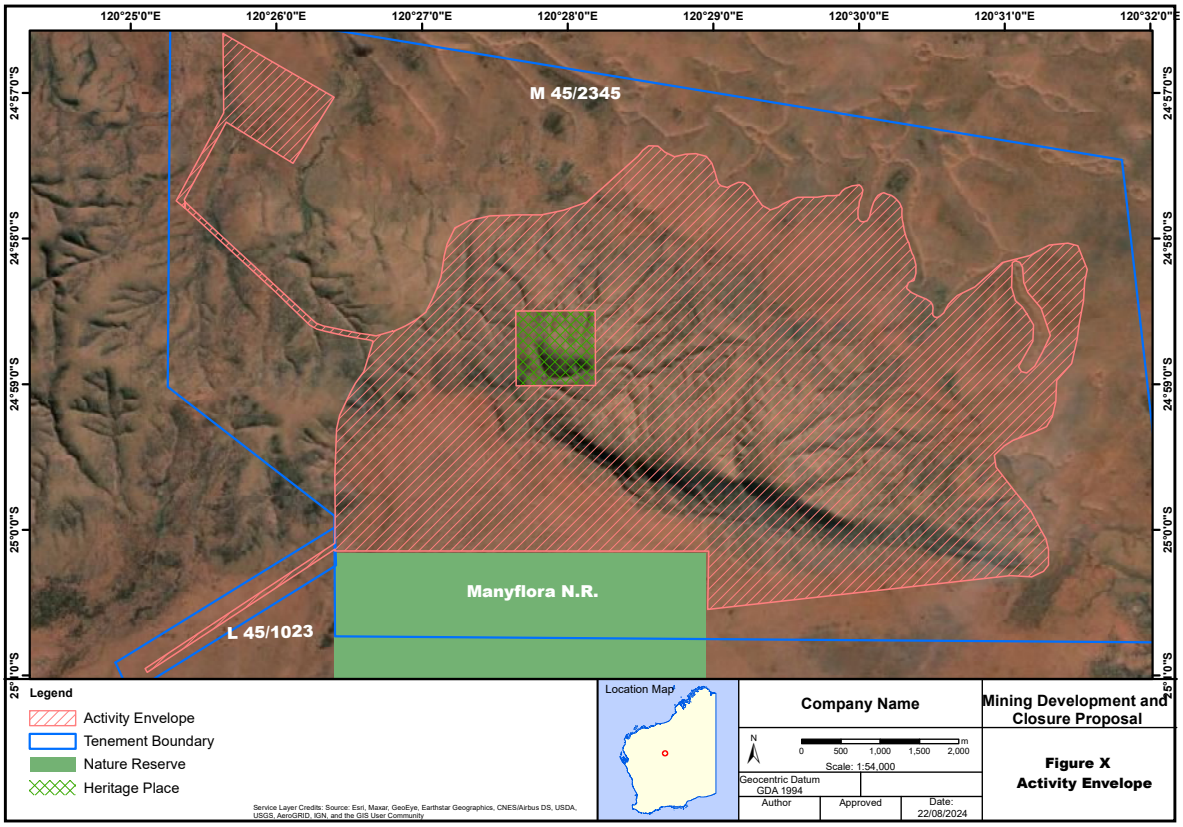
The activity envelope is used to indicate the maximum spatial extent of the mining activities, thus careful consideration should be given to ensure:

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

Where appropriate, the activity envelope needs to clearly demonstrate that sensitive areas (e.g. Aboriginal cultural heritage, reserves, wetlands, waterways, prominent ridges, etc.) have been avoided.

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

Figure 1. Example of an activity envelope where sensitive features (i.e. nature reserve, heritage place and sand dunes) have been intentionally excluded to minimise environmental impacts of the proposed activities.



Amendment to an Approvals Statement

When seeking an amendment to mining activities recorded on an Approvals Statement, 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.

1.3 Site plan(s)

The MDCP must include a site plan (or multiple plans) containing the following aspects:

- all proposed and existing activities;
- tenement boundaries and labels;
- a north indication and scale bar;
- a legend or labelling identifying all activities;
- environmental values such as protected areas, major topographical features, major water courses, locations of conservation significant species;
- the activity envelope; and
- any other relevant information considered pertinent to the proposal.

The purpose of the site plan is to assist with an understanding of spatial/geographical context, key risks of the proposed mining activities and explain how the mining operation will be laid out and function. The site plan can also be used to demonstrate the 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 or to provide all the required information.

The site plan is indicative and provided to assist with assessment only. The activity envelope provides flexibility for changes to the exact location of a mining activity within the tenement, without the need for amendments to the Approvals Statement.

Amendment to an Approvals Statement

When seeking an amendment to mining activities recorded on an Approvals Statement, the site plan should be updated to clearly indicate the additional activities or changes proposed.

If no change is required, the existing site plan should be included with a statement that there is no change from the previous plan.

1.4 Activity details

The Activity Details section of a MDCP must record the mining activities for which approval is sought, and the maximum area required for these activities. The scope and scale of the proposed mining activities forms the basis of approved activities recorded on an Approvals Statement and must be presented using the standard Tables 1 and 2 below. These tables are mandatory and must be completed as set out below and in the Resources Online lodgement system, as this information will be used to generate the Approvals Statement. The activity tables generated via the Resources Online system can be downloaded for incorporation into the MDCP document.

Where appropriate, the MDCP should also include a written description of the proposed mining activities detailing any relevant construction, design and operational requirements. See Section 1.5 for the design information to be provided for engineered landforms and structures where the design is essential to the proposed risk treatment for that landform or structure.

Mining activities must be entered into the tables using the categories presented in Appendix 3.

The activity tables have been designed to allow flexibility for applicants to detail the types of mining activities that will be undertaken on the tenements within the specified activity envelope and area limits. This will allow mining operations to be adaptive and remove the requirement to seek further approvals for minor changes. For most standard mining activities, listing the proposed activity type in Table 1 will be sufficient. Applicants will need to ensure that the risk assessment appropriately captures all the risks associated with the types of activities proposed.

Additional information is required in Table 2 for higher risk, more complex mining activities (key mining activities) to ensure the risks of these activities are understood and appropriately managed. Key mining activities are defined as:

- Evaporation pond.
- Heap leach or vat leach facility.
- Mining void.
- Significant water diversion or management structure.
- Tailings or residue storage facility.
- Waste rock landform or overburden stockpile.
- Minerals-in-brine:
  - Evaporation pond (minerals-in-brine).
  - Halite/salt stockpile.
  - Minerals-in-brine abstraction trench.

The nature and extent column of Table 2 provides applicants with the opportunity to identify key design parameters or location limitations that will minimise risks associated with high risk or complex mining activities. Examples of the type of information that can be captured for the key mining activities is provided in Table 2. The examples are provided as a guide only, with the level of information to be included dependent on the risk associated with the particular mining activity. The intent is for details relating to the nature and extent of the key mining activities to be recorded on the Approvals Statement where appropriate and act as limits/constraints on what is approved.

Table 1. Total mining activity area table (including data entry examples)

Tenement	Total activity area (ha)	Total area of native vegetation to be cleared (ha)	Key mining activities	Supporting mining activities
M01/01	50 ha	50 ha	Mining void Waste rock landform	
M01/02	373 ha	364 ha	Mining void Waste rock landform Tailings Storage facility Heap/vat leach facility Significant water diversion or management structure	Plant site Dam (saline or process liquor) Run of mine pad Other mining activities
G01/03	60 ha	60 ha	Waste rock landform	Other mining activities
L01/01	10 ha	7 ha		Borefield Other mining activities
L01/02	15 ha	10 ha		Other mining activities

Table 2. Key mining activities details table (including data entry examples)

Key mining activity	Reference	Nature and extent	Tenement	Activity Area (ha)
Waste rock landform or overburden stockpile	North WRL	Maximum height 25 m above ground surface. Maximum final overall 14° slope angle, no berms. Basal layer of WRL comprising 2 m oxide and transitional felsic volcanics (S <0.1%) WRL embankments and surface will be armoured with a minimum 1 m cover of NAF waste rock material. PAF cells constructed in accordance with the PAF Management Plan (Appendix x). *WRL constructed over part of backfilled North pit	M01/01	50 ha
Mining void	North Pit	Maximum depth 85 m. Backfilled to surface with mining overburden. Below groundwater table. *WRL constructed over part of backfilled North pit	M01/01 M01/02	13.4 ha 17.3 ha
Mining void	South Pit	Maximum depth 115 m. Below groundwater table.	M01/02	10 ha
Tailings Storage facility	TSF 1	Above ground paddock style TSF constructed as two cells. Maximum height 25.2 m above ground surface with downstream raise in two stages. TSF to be constructed in accordance with TSF 1 Detailed Design Report. (Appendix x). NAF waste rock material (classified as <1% S) will be used in construction of all embankments. At closure surface will be capped with minimum 2 m of competent waste rock and topsoil to form store and release cover with an appropriate capillary break layer to prevent rise of moisture from stored tailings.	M01/02	124.5 ha
Mining void	South pit underground	Portal established at approximately 345 m RL. Underground development to extend maximum of 380 m below base of the pit to -60 m RL (500 m below surface) Underground will utilise multiple drives with maximum dimensions of 5.4 m wide and 7.5 m high. Extent of underground works is displayed in Figure 12. *Portal located within South pit.	M01/02	10 ha*[1]

1 Activity area can be for the surface disturbance associated with a mining void such as an underground portal and/or boxcut, however a fuller description of the three dimensional extent should be included in the 'Nature and Extent' column.

Key mining activity	Reference	Nature and extent	Tenement	Activity Area (ha)
Heap/vat leach facility	North Heap Leach	Maximum height of 40 m above ground surface. 25 cells (65 m x 720 m) total. Total volume: 58.1 Mt Liner design: Natural ground, subgrade compacted soil layer, HDPE liner (1.5 mm thickness), cushion layer and then stacked ores. Leak detection: inclined monitor bores. Reticulation system type: Cyanide solution to be applied via drippers, the pregnant solution will gravity flow into the collection box installed outside of the berm via primary and secondary drainage pipes. Bunding: The heap leach pad area will be bunded by safety berm and the surface water will be collected by diversion channel and berm around the toe of the heap. Tonnes treated per annum: 5,000,000 tonnes of ore/year. Ore density placed on heap: 1.5t/m³ bulk density to be applied in the design. At closure the Heap Leach will be battered down to a single slope of 15 degrees and covered with 2 m of competent waste rock.	M01/02	141.12 ha
Waste rock landform or overburden stockpile	South WRL	Maximum height 40 m. Maximum final overall slope angle 18°. 10 m wide bench constructed midway between batter slopes. WRL embankments and top surface armoured with minimum 1 m NAF waste rock material. Landform will be located at least 20 m away from edge of South creek or other surface water drainage lines.	M01/02 G01/03	20 ha 50 ha
Significant water diversion or management structure	South flood bund	A levee of up to 9 m in height (including 0.5 m freeboard) around the south-east perimeter of South Pit.	M01/02	3 ha

1.4.1 Overlapping mining activities

There is no requirement to specify where mining activities overlap. Table 1 sets out the maximum total area to be disturbed for mining activities per tenement and Table 2 sets out maximum disturbance areas for each key mining activity. In circumstances where activities overlap, i.e. waste rock landform located on area of backfilled mining void, applicants should ensure the total activity recorded for the tenements considers this overlap. The area where a mining void and waste rock landform overlap only needs to be accounted for once in the activity area recorded in Table 1. While Table 2 must still appropriately record maximum area for the mining void proposed and maximum area for the waste rock landform proposed. Applicants may wish to include notes in the Table 2 to demonstrate where activities overlap to provide clarification on activity areas. An example is shown in the example Table 2 above.

Amendment to an Approvals Statement

When seeking an amendment to mining activities recorded on an Approvals Statement, the activity details tables should detail of the additional mining activities or changes required to existing activities. During online lodgement of the MDCP existing activity details tables will be available to edit and download for inclusion in the MDCP document.

1.5 Additional information

1.5.1 Detailed design information

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

- tailings storage facility (TSF) (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, encapsulation of naturally occurring radioactive materials).

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). DEMIRS expects detailed design reports for TSFs to be appended in an MDCP.

1.5.2 Sterilisation report

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

1.5.3 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.

2. Legislative framework

A MDCP must detail 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.

To ensure all relevant information is provided, the environmental approvals and regulatory requirements should be presented using the standard table below (Table 3).

Table 3. Example Environmental Legislative Framework table.

Environmental Factor	Risk pathway regulated	Relevant legislation	Relevant Approval Condition/outcome	Phase of mine life
Inland waters	Groundwater abstraction results in drawdown within alluvial aquifer adversely impacting existing local water users.	*Rights in Water and Irrigation Act 1914*	5C licence to take 0.5 ML/year of groundwater within the Goldfields. Groundwater Management Area 26D licence to construct 8 bores within the Goldfields Groundwater Management Area	Operations

For each approval or statutory requirement listed, the MDCP should identify the specific risk pathway(s) that will be regulated by the approval or statutory requirement and the phase of mine life it relates 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 1972*
- *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*
- *Heritage Act 2018*
- *Metropolitan Water Supply Sewerage and Drainage Act 1909*
- *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*
- *Work Health and Safety Act 2020*

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 approval is obtained for the activity under the Mining Act.

Where a risk pathway is directly regulated under another regulatory framework and this is clearly articulated in the 'legislative framework' section, it does not need to be included in the risk assessment and outcomes sections of the MDCP (sections 6 and 7 of this guidance). 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 environmental 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 seeking an amendment to mining activities recorded on an Approvals Statement, the legislative framework section should detail the relevant environmental approvals and statutory requirements that relate specifically to the additional mining activities or changes required.

If no change is required, the legislative framework table should be included with a statement that there is no change to the existing legislative framework.

2.1 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* (EP Act), 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, unless aspects are deferred to DEMIRS as a relevant decision-making authority (DMA). The proposed activities need to be within the spatial boundaries and scope of the EPA assessment for this to apply.

The information can be presented as a separate table similar to the example Table 4 provided below.

Table 4. Example table for 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 (where applicable) and/or EPA assessment report	Link to baseline information (e.g. technical reports) relevant to MDCP
Flora, vegetation and fauna	Clearing of vegetation impacting on survival of conservation significant species.	Flora and Vegetation EPA objective: To protect flora and vegetation so that biological diversity and ecological integrity are maintained. Section 7 of Environmental Review document. Relevant to construction, operation and care and maintenance.	3–1 The proponent shall implement the proposal to meet the following environmental outcomes: (1) direct disturbance to be confined to the development envelope identified in Figure 2, limited to 3,830 ha; (2) the loss of no more than (one) 1 population of the flora species *Aenictophyton anomalum* within the development envelope; (3) no direct disturbance in exclusion areas for *Aenictophyton anomalum* identified on Figure 3; and (4) the loss of no more than 10 per cent of the known population of *Goodenia asteriscus* or *Amaranthus centralis*, or more than 5.2 per cent of any other priority flora species.	Appendix B Detailed Flora and Vegetation Survey Appendix C Assessment of potential groundwater dependent ecosystems

The MDCP will need to address environmental aspects not assessed under the Part IV of the EP Act, and any aspects deferred to DEMIRS' assessment under the Mining Act. The 'environmental data and analysis', 'risk assessment and management', and 'environmental and closure outcomes' sections of the MDCP should focus on the environmental aspects not directly regulated/not assessed under Part IV of the EP Act or deferred to DEMIRS as a DMA.

Parallel environmental assessments and approvals under Part IV of the EP Act and Mining Act are encouraged, and it is acknowledged that some decisions on what aspects will be deferred or partly managed by other DMA's may only be made later in the EPA's assessment process. In these scenarios, timing of the MDCP submission should be considerate of the current stage of the EPA assessment process or may need to include all the relevant information on the key environmental factors to ensure further information is not required by DEMIRS later in the parallel assessment process. Ongoing consultation with DEMIRS is recommended to ensure a parallel assessment runs as smoothly as possible.

2.2 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 (NVCP) under Part V of the EP Act**,** 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 flora, vegetation and fauna 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.

2.3 Interaction with *Aboriginal Heritage Act 1972*

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 clearances/restrictions under the *Aboriginal Heritage Act 1972* and the status of any applications.

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

3. Environmental data and analysis

Site specific 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 environmental data needs to be summarised and interpreted in the MDCP document, with technical reports appended. Digital spatial datasets for baseline data (e.g. vegetation communities, vegetation types, dieback mapping) should be provided where available.

This guideline has been designed to ensure the details presented in an MDCP focus on interpretation and analysis of the environmental data and is not simply a repetition of raw results. It is important the MDCP sets out the broader context of where the mining operations sit within the wider landscape and describes the local environmental conditions specific to the mining operation.

Thus, it is intended that the environmental data and analysis section of the MDCP be presented in two parts:

- Environmental and social setting.
- DEMIRS environmental factors.

Guidance on the type of information to be presented for "environmental and social setting" is set out in Section 3.1 and guidance on the type of information to be presented on "DEMIRS environmental factors" is set out in Section 3.2.

Sections 3.3 to 3.5 provide guidance on the aspects, information and studies applicants should consider for each of DEMIRS' environmental factors. These sections are intended as general guidance on common environmental aspects and studies and are not intended as an exhaustive list. Given the varying nature and location of mining operations across Western Australia, not all aspects and studies may be relevant to a particular mining operation. Applicants need to ensure all environmental aspects are considered based on the nature, scale, and location of their mining operations.

3.1 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 setting at a regional and local scale.

Aspects to consider include:

- seasonal and climatic conditions and projected future climate profile;
- topographic relief and 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).

Where appropriate, this section should identify matters/aspects of significance that may be impacted by the mining activities. For example, the section should describe any Aboriginal heritage sites identified through stakeholder engagement and/or surveys within the activity envelope or surrounds.

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

If no change is required, the MDCP should state there is no change to the existing environmental and social setting.

3.2 DEMIRS environmental factors

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

- terrestrial environmental quality;
- inland waters; and
- flora, vegetation and fauna.

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

- List of completed technical studies.
  - It is recommended this is presented in the standard table format presented in Table 5.
- Analysis of technical studies and implications for mining operations.
  - Analysis should include a description of key sensitivities or aspects 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 and climatic conditions and the considerations for long term landform design).

Table 5. Example technical studies table.

Document Reference (including consultant/year)	Linked Appendix
Baseline Soil Study, Banksy Environmental Consultants, May 2023.	Appendix B
Characterisation of Waste Rock Materials, Geochemical Consulting, January 2024	Appendix C

Amendment to an Approvals Statement

When seeking an amendment to activities recorded on an Approvals Statement, the environmental data 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 environmental studies and ensure this information is incorporated into the MDCP.

For minor amendments the MDCP should include the environmental data and analysis in the context of the new or changed activities proposed.

3.3 Terrestrial environmental quality

3.3.1 Soils

The level of detail required for soils will depend on the scale, nature and location of the mining activities proposed. Aspects to be considered when developing a MDCP include but are not limited to the following:

- A description of the major soils occurring in the activity envelope including the indicative volume of topsoil and subsoil available for rehabilitation. Reference to the characterisation methodology used should be included in the MDCP. Where appropriate soils may be classified according to the Australian Soil Classification (Isbell and NCST 2021).
- 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.
- Physical and chemical characterisation of soils to identify baseline characteristics and potential for use as a rehabilitation medium, including susceptibility to erosion and ability to support growth of native vegetation. Key parameters include:
  - Soil salinity and pH.
  - Exchangeable cation and sodicity.
  - Plant available nutrients.
  - Soil texture.
  - Particle size distribution.
  - Soil structural stability (Emerson Test and potential for clay dispersion).
  - Hydraulic conductivity.
  - Propensity for hard-setting.
  - Total metal concentrations.
  - Water repellence.
- Potential for *Phytophthora* dieback when operating in susceptible areas.
- Potential for acid sulphate soils when operating in susceptible areas.
- Volumes of soils required to complete rehabilitation, identification of any shortfall of available material, and where relevant, mitigation measures to address the deficiency.

It is recommended that relevant information on soils is summarised in table format, with an example provided in Table 6 below.

Table 6. Example presentation of soil characterisation summary within MDCP.

Soil unit / classification	Percentage of project area (%)	Estimated volumes	Baseline growth medium			Risk indicators		
			Baseline growth medium	Water holding capacity	Nutrient status	Salinity	Sodicity	Emersion class
Topsoil (e.g. 0–150mm)	70%	181,217	High potential	Clay presence means good water and nutrient holding capacity	344 mg/kg Total Nitrogen (TN) 42 mg/kg Total Phosphorous (TP)	Non-saline	11%	2–4
Subsoil (e.g. 150–300mm)	55%	16,821	Moderate potential	Clay presence means good water and nutrient holding capacity	344 mg/kg Total Nitrogen (TN) 42 mg/kg Total Phosphorous (TP)	Low salinity	34%	2–4

Where relevant details on the volumes of topsoil and subsoil required for rehabilitation need to be provided to demonstrate the site's rehabilitation materials balance.

3.3.2 Subsurface materials and mining waste

In the context of this guideline, 'subsurface materials and mining waste' refers to all material that is mined and either processed/treated or stockpiled/stored as waste or low-grade. This includes but is not limited to, overburden, ore, heap leach piles, waste rock material, processing waste and tailings.

The MDCP should include a concise description of the geology of the project area, along with mineralogy of dominant lithologies. Estimated volumes of the subsurface materials and mining waste that will be encountered over the life of mine are to be included.

To ensure adequate physical and geochemical characterisation of all waste and subsurface materials, and early identification of any problematic materials, it is highly recommended material sampling and testing commence during the exploration phase and be further refined during resource definition. Mineralogy and geochemical assay of drill cuttings and core can be used to inform planning for further physical and chemical testing.

Detailed understanding of the geochemical and physical characteristics of these materials is critical for managing risks caused by storage and/or stockpiling and planning for environmentally responsible mine closure. Appropriate material characterisation informs the environmental risk assessment and is instrumental 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.

The level of information required on subsurface materials and mining waste will depend on the scale and nature of mining activities proposed. The information provided must demonstrate that the applicant understands the characteristics of all materials to identify the relevant risks, establish controls and appropriately design landforms or storage facilities. 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.
- Sodic, dispersive or highly erodible 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 Australian Government's 'Leading Practice Sustainable Development Program for the Mining Industry' – 'Preventing Acid and Metalliferous Drainage' provides detailed guidance on the characterisation of materials during different phases of a project, to identify potential risks prior and during mining. The guidance provided in this MDCP guideline does not attempt to replicate this handbook and is provided as a guide to the type of information that can be presented in a MDCP.

The following sections provide further guidance on aspects to be considered for materials characterisation.

Material volumes

It is recommended that indicative volumes and proportion of each type of subsurface material/ mining waste be presented in a table format similar to the example Table 6 below, the breakdown of material types/classification will depend on the specific project. The MDCP should provide detail on the volumes of material that is required to manage difficult waste, achieve stable landforms and complete rehabilitation, as well as identify any shortfalls in suitable material and detail any mitigation measures to be implemented to address the deficiency.

Table 7. Example of how to present indicative volumes of mined material.

Waste / Year	Oxide	Transitional	Fresh	Tailings	Total
1	4,762,570	2,047,765	111,866	0	6,922,201
2	4,502,424	1,910,842	1,193,716	0	7,606,983
3	899,544	2,919,943	914,663	440,000	5,174,150
4	855,582	1,664,532	1,658,055	440,000	4,618,169
Total	11,020,120	5,623,139	1,658,055	880,000	19,181,314
% of total waste material	57%	29%	9%	5%	–

Sampling

The number of samples required for the geochemical and physical test work is specific to each project and will depend on the nature and volume of material being mined, 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.

Adequate levels of sampling are required to determine the distribution of relevant geochemical and physical properties in the subsurface materials and mining waste. The MDCP should demonstrate that the sampling conducted is representative of the material to be mined/disturbed and has enabled identification of relevant risks. The use of a figure to show the spatial location of all samples in relation to the proposed area to be mined is recommended. Statistical analysis can be used to demonstrate the results are representative.

For initial sampling and testing, and where no prior information is available, the below Table 8 can be used as a general guide for sample selection.

Table 8. Suggested initial sampling frequency based on tonnage where no prior information is available. Reproduced from MEND (2009).

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

Appropriate characterisation test work will be required to demonstrate an understanding of the environmental risks posed by materials and to identify any materials with properties that present closure risks. This may include (but is not limited to) the following:

- Particle size distribution (PSD).
- Emerson Test.
- Geochemical Abundance Index (GAI).
- Mineralogy (general, fibrous, radioactive).
- Leach testing.
- Static testing (e.g. sulfur, total elemental analyses, soluble elements, pH).
- Acid Base Accounting (ABA).
- Net acid generation.
- Kinetic leaching testing (humidity cells, column testing, field trials).
- Tests for physical durability, erodibility.

The below Table 9 provides an example of how to summarise materials characterisation results in the MDCP, specific parameters used will vary depending on the project. The summary must present information that is relevant to the project. All technical reports outlining methods used, results and analysis should be included as appendices.

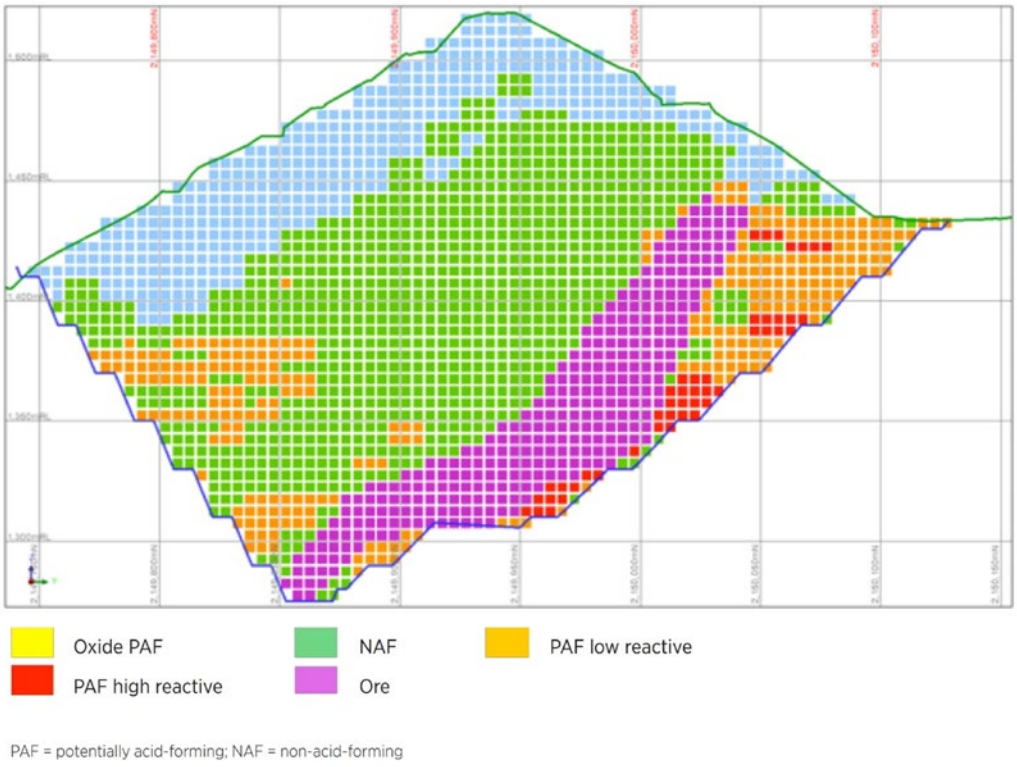
Table 9. Example of how to present detailed materials characterisation results.

Material	Lithology Type	Total Volume (bcm)	No. Samples	%S	PAF / NAF classification	Fibrous Material	Radioactivity	Emerson Classification
Oxide	Weathered Mafic and Ultramafic	11,020,120	5	0.1	NAF	Not present	Not present	2
Transitional	Transitional Mafic and Ultramafic	5,623,139	4	0.1	NAF	Present	Not present	3–4

Block model

Three-dimensional block models are a useful way to represent the geology and mineralisation of a project, calculate volumes and show the occurrence of problematic materials such as potentially acid forming waste lithologies. They can also help to spatially present sampling locations. Where utilised, these models should be briefly summarised in the MDCP with supporting documentation included as appendices. An example of visualisation from a block model representing PAF subsurface material is presented in Figure 2.

Figure 2. Visual representation of PAF, NAF and Ore Zones in vertical cross section relative to proposed open-pit shell(DAFT 2016).



3.4 Inland waters

3.4.1 Surface water

The level of detail required for this section will depend on the scale and nature of the mining activities proposed, degree of interaction with surface water systems, environmental sensitivities and water requirements.

Aspects to be considered when developing a MDCP include but are not limited to the following:

- 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/rivers, playa lakes, wetlands, water holes, groundwater connectivity).
- Environmental values and beneficial uses of surface water.
- Surface water management areas intersected or potentially impacted by proposed mining activities (e.g. Primary Water Resource Management Areas, Threatened Ecological Communities, RAMSAR wetlands).
- Surface water quality characteristics including turbidity, salinity, nutrients, pH, and any other chemical and physical parameters relevant to understanding surface water quality in relation to the proposed mining activities.
- Surface water seasonal and interannual variability in flows and water quality.
- Flooding characteristics of the area including pre-mining, operational and post mining landscapes. Where flooding presents a risk to the environmental management of the mining operation (including post-closure) flood modelling and mapping should be provided.

3.4.2 Groundwater

The level of detail required for groundwater will depend on the potential for the proposed mining activities to impact on the groundwater system and environmental values for groundwater.

Aspects to be considered include:

- 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 considered:

- Map of the inferred groundwater resources and extent of dewatering, any other impacts related to water extraction, site activities and water use during operations.
- Prediction of groundwater recovery utilising a numerical model or numerical analysis and consideration of formation of pit lakes.
- Assessment of water quality and potential impacts to the surrounding aquifer and environmental values. Selection of chemical and physical parameters needs to consider potential contaminants from mining activities and develop suitable sampling and analysis.
- Description of the interconnectivity between the ore body, water supply aquifers, dewatered aquifers and lateral, overlying and underlying aquifers and surface water.

Further guidance on surface water and groundwater can be obtained from the following sources:

- Australian Government: Climate Change in Australia: www.climatechangeinaustralia.gov.au/en/overview/
- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (www.waterquality.gov.au/anz-guidelines)
- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (application of the water quality guidelines to groundwater): www.waterquality.gov.au/anz-guidelines/resources/guidance/groundwater
- Australian and New Zealand Guidelines for fresh and marine water quality (2020) Assessing and Managing water quality in temporary waters (www.waterquality.gov.au/sites/default/files/documents/assessing-and-managing-water-quality-in-temporary-waters_0.pdf)
- Department of Water and Environmental Regulation's Water Quality Protection Guidelines (www.wa.gov.au/service/natural-resources/water-resources/water-quality-guidance).
- Geoscience Australia: Australian rainfall and runoff guidelines (arr.ga.gov.au/)
- National Health and Medical Research Council (2011) Australian Drinking Water Guidelines: (www.nhmrc.gov.au/sites/default/files/documents/attachments/publications/Australian_Drinking_Water_Guidelines_ADWG_V3-8_Sep2022.pdf)

3.5 Flora, vegetation, and fauna

Biodiversity data is required to understand the pre-existing assemblages, diversity, condition and ecological function of flora, fauna and ecological communities 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.

Aspects considered relevant to biodiversity include:

- A description of the pre-existing biodiversity/flora/fauna/aquatic/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 (2016a), Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment.
  - EPA (2020), Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment.
- 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 (2016b), Technical Guidance – Sampling of Short Range Endemic Invertebrate Fauna.
- EPA (2021) Technical Guidance – Subterranean Fauna Surveys for Environmental Impact Assessment.

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

4. Stakeholder engagement

Early and continuous stakeholder engagement is essential to understand and manage stakeholder expectations and mitigate potential risks of directly impacting stakeholders associated with the proposed mining activities.

The MDCP must include:

- Details on the stakeholder engagement that has been undertaken leading up to the submission of the MDCP.

Key stakeholders are defined as directly impacted groups including underlying landholders, reserve vestees, Traditional Owner groups/Native Title Claimants and post mining landowners/managers.

The MDCP needs to provide details on the active engagement that has been undertaken with key stakeholders regarding the proposed mining activities, including rehabilitation and closure requirements and the post-mining land use. The information is required to be presented in a stakeholder engagement register. At a minimum, the stakeholder engagement register should include the information as set out in standard register format provided in Table 10 below. Key decisions or outcomes determined through stakeholder engagement should be appropriately documented (e.g. minutes of meetings accepted by key stakeholders) and where appropriate provided with the MDCP).

Where there are sensitivities with name(s) or information related to stakeholder engagement, this can be provided as a separate confidential Appendix.

Table 10. Example 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 focused level of engagement with stakeholders is undertaken by companies at the approvals stage; however, meaningful engagement is necessary at all stages of an operation and operators should develop a strategy for ongoing stakeholder engagement throughout the life of a mine. To assist applicants and operators in understanding the level of engagement that would be appropriate as the operation moves through the stages of mining, DEMIRS has developed a simple guidance table which is set out in Table 11 below. Table 11 is intended as general guidance and should be considered within the context of the scale and nature of the mining activities and the environment in which they are located.

Table 11. DEMIRS expectations for key stakeholder engagement.

Stage of Mining	DEMIRS Expectations	Level of engagement	Level of information
Investigations/ exploration/pre-mining	• Identification of stakeholders (key vs other). • Develop a stakeholder engagement plan. • Post Mining Land Use options identified. • Risk assessment for the project exists.	• Contact regarding land access, introduction to proposed activities. • Present the risk assessment, particularly as it pertains to closure of the site and residual risks. • Develop and present the proposed post-mining land use to key stakeholders/land managers.	• 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.
Construction/ Operations	• Closure outcomes set out in the Approvals Statement. • Completion criteria further refined and developed to support the closure outcomes and post mining land use.	• Regular scheduled engagement as per the stakeholder engagement plan. • Present progress of mining operations, progressive rehabilitation, and any updates to the risk assessment that may impact closure of the site and residual risks. • Additional post-mining land use options that may arise or repurposing of the land.	• 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	• Works undertaken in accordance with Mine Closure Plan to support achievement of closure outcomes, completion criteria and post-mining land use.	• Regular updates showing progress with decommissioning and closure tasks. • Present the risk assessment, particularly as it pertains to closure of the site and residual risks. • Additional post-mining land use options that may arise or repurposing of the land. • Regular updates detailing tracking towards meeting closure outcomes/ completion criteria, with any proposed adjustments discussed.	
Post Closure Monitoring and Maintenance	• Monitoring and maintenance to ensure compliance with conditions and closure outcomes set out in the Approvals Statement.		
Relinquishment	• Gain sign off for post-mining transfer of assets, or relinquishment.	• Signed agreements for handover of assets.	• Copies of signed agreements, any documentation pertaining to handover of assets.

Amendment to an Approvals Statement

When seeking an amendment to mining activities recorded on an Approvals Statement, the MDCP should summarise the stakeholder engagement that has been undertaken in relation to the changes being proposed.

5. Post mining land use

The MDCP must present the proposed post mining land use and consider how it 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.
- Considerate of cultural values.
- Ecologically sustainable in the context of the local and regional environment.

Where possible, applicants are encouraged to consider applying resources to achieve improved land management and ecological outcomes on a wider landscape scale, as well as the potential for multiple land uses.

The following land use options provide a guide to identifying appropriate post-mining land use(s):

- Reinstate "natural" ecosystems to be as similar as possible to the original ecosystem.
- Reinstate the pre-mining land use.
- Develop an alternative land use with beneficial uses other than the pre-mining land use.

  Examples:

  - Options involving advanced infrastructure projects may be considered viable, including renewable energy generation. Note – suitable tenure will be required for alternative land use options.
  - Commercial development.
  - Residential use.

Acceptance of the post mining land use by key stakeholders means there is a shared understanding of what will be achieved at closure. Where there might not be consensus with all key stakeholders on the post mining land use, it will be the role of government to work with applicants and underlying land holders/managers to resolve this on a case-by-case basis.

Amendment to an Approvals Statement

When seeking an amendment to mining activities recorded on an Approvals Statement 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 proposed post-mining land use. The applicant must clearly demonstrate engagement with key stakeholders relating to any proposed changes.

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

6. Risk assessment and management

An environmental risk assessment of the proposed mining activities must be undertaken using the risk assessment framework presented in Appendix 3.

The standardised risk assessment framework provides the tool for applicants to assess risks associated with the proposed mining activities, including risks to successful mine closure. It enables applicants to identify appropriate management measures to ensure risks are reduced to as low as reasonably practicable and demonstrate that DEMIRS environmental objectives can be met. It is acknowledged that applicants may have their own separate risk assessment process that is used for different purposes as part of the mining operation, however DEMIRS standardised risk assessment must be used for the risk assessment presented in the MDCP.

The risk assessment needs to cover all relevant risk pathways affecting DEMIRS environmental factors, across all phases of the mine for the activities proposed in the MDCP. The risk assessment process should be undertaken using appropriate internal or external expertise to ensure the assessment is adequately informed by people with the relevant technical knowledge and experience.

It is acknowledged that through the mine planning/feasibility phase, risk pathways may be eliminated or avoided such as when:

- The activity envelope excludes an area of land with a particular value/sensitivity, resulting in the elimination of a risk pathway for direct impact to that value/sensitivity.
- A proposed activity has been limited 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 in relation to contamination of groundwater.

Where appropriate for complex mining operations or greenfield sites, it is recommended that avoided and eliminated risks are still included in the risk assessment to present a holistic assessment on how the mining operation has avoided adverse environmental impacts to meet DEMIRS environmental objectives. Applicants need to also ensure the risk assessment still includes risks from indirect impacts where a direct impact has been eliminated or avoided.

A risk pathway that is directly regulated by another agency or covered by another regulatory requirement is to be described in the Legislative Framework section of the MDCP and does not need to be repeated in the risk assessment. However, the risk assessment will need to consider the different phases of mine life when considering whether a risk pathway is regulated by another agency. For example, risk pathways related to direct clearing of native vegetation may be regulated under a Native Vegetation Clearing Permits, however indirect impacts to native vegetation from construction and operation of mining activities will not be regulated under the clearing permit.

The risk assessment needs to:

- Identify all the risk pathways and potential direct and indirect 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 the hierarchy of hazard control.
- Re-evaluate the risk pathways to derive a residual risk rating.
- Demonstrate that all residual risks are managed to as low as reasonably practicable (ALARP) and consistent with DEMIRS' environmental objectives.

The outcome of the risk assessment needs to be recorded in the risk register as presented in Appendix 4 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.

Further detail regarding environmental and closure outcomes and DEMIRS standard outcomes are provided in Section 7 and Appendix 5.

Amendment to an Approvals Statement

When seeking an amendment to mining activities recorded on an Approvals Statement, the risk assessment needs to focus on risk pathways associated with the changes being proposed. If these changes are substantial, 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 are adequately covered by a previous risk assessment in an MDCP and the existing environmental/closure outcomes, the "Risk Assessment and Management" section of the MDCP can state that there are no additional risk pathways, however, must also provide appropriate justification and explanation for this.

6.1 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 treatment and impact, having a greater level of detail.

As detailed risk treatment information is often difficult to display within a risk register, it may be of benefit to include a written description of more complex risk treatments in the body of the MDCP document or in an appendix. This is particularly relevant when a submission includes high or extreme inherent risk pathways or risk pathways associated with long lag risks, and may include detail of any internal monitoring, reporting or indicators that will be used to determine if the treatments are working.

Risk treatments should consider whether buffers for environmentally sensitive features (where features can't be excluded from the activity envelope), or limitations on location for key mining activities, are required to manage risks. For example, to minimise risk of erosion of waste rock landforms the risk treatment may include ensuring the landforms are not located on drainage lines present within the activity envelope. Buffers or location limitations required to minimise environmental risks may be specified in the activity details tables or in site specific environmental outcomes (see Section 7.2).

7. 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, environmental outcomes identified in a MDCP will function as a condition of approval and be recorded on the Approvals Statement. Closure outcomes will be recorded separately on the Approvals Statement.

The MDCP must include:

- Environmental outcomes (both standard and site specific) identified via the risk assessment with details of the proposed monitoring that will be undertaken to demonstrate compliance with the outcomes.
- 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.

The environmental and closure outcomes should be presented in table format and include the information set out in Tables 12 and 13 below.

Table 12. Environmental outcomes table with monitoring program (including data entry examples).

DEMIRS objective	Risk pathway	Environmental Outcome	Monitoring (method and frequency)
To protect flora and vegetation, subterranean fauna and terrestrial fauna so that biological diversity and ecological integrity are maintained.	1. Vehicle and machinery movement introduce and spread weeds resulting in competition/impact to native vegetation.	F5. 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.	Monthly inspections of operational areas and topsoil stockpiles for weed infestations. Internal register to log and treat weeds identified.

Table 13. Closure outcomes table with completion criteria and monitoring (with data entry examples).

Closure outcome	Domain	Risk Pathway	Completion Criteria	Monitoring
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's potential zone of instability (PZoI).	Waste rock landforms.	Landforms placed within PZoI resulting in structural failure causing impacts to the environment.	All landforms will be placed outside the PZoI.	Aerial survey annually during operations. Aerial survey at start of closure implementation.

Amendment to an Approvals Statement

When seeking an amendment to mining activities recorded on an Approvals Statement, the MDCP should detail if changes are proposed to the environmental and closure outcomes recorded on the existing Approvals Statement.

If no changes are proposed, the outcomes tables should be included with an appropriate explanation as to why there is no change required.

7.1 Standard environmental and closure outcomes

DEMIRS has developed a list of standard environmental and closure outcomes (see Appendix 5) that are intended to ensure mining activities proposed in a MDCP meet DEMIRS' environmental objectives for each environmental factor. These standard outcomes have been developed with consideration of the DEMIRS Environmental Objectives Policy for Mining.

A particular standard outcome may not be required where it can be demonstrated that the risk pathway is directly regulated by another agency or regulatory requirement, or where it can be demonstrated that the outcome is not relevant as no relevant risk pathway exists.

7.2 Site specific outcomes

For many mining operations, DEMIRS' standard environmental and closure outcomes will be adequate to ensure the site is appropriately regulated. 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 desired outcome is not adequately covered by the standard environmental or closure outcomes, or where there are complex environmental risks involved that require more targeted outcomes to ensure the broader DEMIRS environmental objectives are met. Examples where site specific outcomes may be required include:

- The mining activities proposed involve complex, 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.
- Areas of high ecological or biodiversity value where restoration/rehabilitation is essential to mitigating the risk associated with the mining operation.

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 an acceptable level of impact;
- 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.

7.3 Completion criteria

Completion criteria are to be developed in association with the closure outcomes included in the MDCP. Completion criteria are necessary to demonstrate the success of rehabilitation and mine closure and hence the achievement of closure outcomes. Completion criteria need to 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.

In contrast to the closure outcomes which are set at the approval stage and are not refined over time, it is expected that completion criteria will be refined through the mine closure planning process. It is important that completion criteria are considered at the approval stage to inform mine closure knowledge gaps and shape future monitoring and investigative tasks. Completion criteria should be developed in consultation with key stakeholders, including DEMIRS, and be appropriate to the phase of the project. It may be appropriate to present conceptual completion criteria in the MDCP which are then refined and updated in subsequent MCP submissions in response to monitoring, research, trial information or any other information or change as appropriate.

For further guidance on developing completion criteria, refer to: A framework for developing mine-site completion criteria in Western Australia, developed jointly by DEMIRS and the Western Australian Biodiversity Science Institute.

8. Monitoring

A MDCP must include details on the methodology and timing/frequency of monitoring that will be undertaken to demonstrate that environmental outcomes are being met and to demonstrate the progress towards and/ or achievement of closure outcomes.

Regular monitoring is required against the relevant 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 risk assessment informs the necessary monitoring frequency, with greater inherent risks needing 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 DEMIRS as part of an operation's environmental reporting obligations.

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 levels be established to provide an early warning system that allows for additional management measures or contingency plans to be implemented before any conditions recorded on an Approvals Statement are breached.

Amendment to an Approvals Statement

When seeking an amendment to activities recorded on the Approvals Statement, the MDCP should detail if the changes will result in a change to the existing monitoring framework. In particular, if changes to environmental and closure outcomes are proposed, the MDCP should indicate whether additional monitoring is required and provide details on methodology and monitoring frequency.

If no change is required, the existing monitoring program should be included with a statement that there is no change.

9. Closure implementation

The MDCP must include details on how proposed mining activities will be decommissioned, rehabilitated and closed in order to ensure closure has been appropriately considered at the approval stage and to demonstrate that DEMIRS environmental objectives can be met.

The rehabilitation and closure related information considered necessary for DEMIRS to assess the acceptability of mining activities at the approval stage includes:

- closure designs for key mining activities;
- identified knowledge gaps and schedule for addressing them; and
- identified opportunities for progressive rehabilitation.

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 infrastructure with similar rehabilitation, decommissioning and closure requirements/outcomes. Examples of domains at a mine are:

- ore processing area;
- infrastructure;
- tailings storage facilities;
- waste rock 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 rock landforms, mining voids, tailings storage facilities and other structures.

The domain model provides a useful 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 provided by applicants in the closure implementation section of the MDCP must be proportionate to the stage and remaining life of mine. For mining operations with a short life of mine (e.g. projected mine life of two years or less) there is limited ability to further refine mine closure planning and address any key knowledge gaps following the initial approval stage. Given this, DEMIRS expects an advanced level of detail on closure implementation in the MDCP to demonstrate that closure outcomes can be achieved.

This should include:

- Detailed closure designs for key mining activities that will be remaining post closure. This may include landscape drawings showing how final landforms will interact with key features such as drainage lines and surrounding topographical features and technical drawings/cross sections showing design information (heights, angles, surface treatments, surface water management, zones of instability, containments cells for problematic materials etc.).
- Knowledge gaps must be well defined and have clear actions which can be achieved prior to closure.
- A detailed progressive rehabilitation and decommissioning schedule to demonstrate how rehabilitation and closure tasks have been integrated into the mining schedule. This may include a clear breakdown of rehabilitation and closure earthworks and tasks with clear timeline for completion and key personnel responsible for delivery.

For further guidance on mine closure planning, refer to the Guideline for preparing Mine Closure Plans available on the DEMIRS website.

Amendment to an Approvals Statement

When seeking an amendment to mining activities recorded on an Approvals Statement, the detail presented in the closure implementation section should relate specifically to the additional mining activities or changes required. For example, for an MDCP seeking approval for an additional waste rock landform, the closure implementation section needs to present closure designs, knowledge gaps, progressive rehabilitation opportunities and contingencies for early closure or suspension of operations that relate specifically to the additional landform.

9.1 Closure Designs for key mining activities

The MDCP must provide closure designs for the key mining activities proposed. The design details should include:

- Design parameters and justification for the design.
- Detailed diagrams or cross sections.
- Landscape drawings of the site showing drainage lines/features and flood modelling.

The closure designs presented at the project approval stage may be conceptual but will need to be refined in the subsequent Mine Closure Plan submission(s). Final designs are required at a minimum of two years prior to implementation. The level of information provided in the MDCP needs to provide sufficient information to indicate landforms can be successfully rehabilitated and closed to meet DEMIRS' principal objective for environmental regulation as detailed in the DEMIRS Environmental Objectives Policy:

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.

Where landforms present long-term erosion risks, incorporate dispersive materials or store PAF materials, modelling is recommended to demonstrate the landform will be safe, stable, non-polluting and self-sustaining for the long-term. Hydrological models are also recommended to assess impacts to surface water or groundwater.

9.2 Knowledge gaps

Based on the analysis of the environmental data and consultation with key stakeholders, applicants will have evaluated aspects where further data/knowledge is required to verify closure risks and assumptions made during mine planning. It is acknowledged that not all information to support successful closure will be available at the approvals stage and is collected and refined over the life of mine. It is important that knowledge gaps are identified at the approvals stage to ensure that actions to address them are appropriately scheduled, provisioned for and assigned ownership during the life of mine.

It is recommended the knowledge gaps are presented in a table format as shown in Table 14 below.

Table 14. Example of a knowledge gap register.

Knowledge Gap Register						
#	**Aspect**	**Knowledge Gap**	**Planned Action**	**Action Owner Title / Role**	**Timing for Completion**	**Progress[2]**
1	Climate	Impact of climate change	Analyse environmental monitoring data (e.g. rainfall, temperature, and vegetation data) to identify any trends relating to climate change which may affect closure and determine if any of these will materially affect closure planning for the mining operation.	Closure Manager	2030	
2	Waste rock landforms	Landform evolution and stability over the long-term	Conduct waste landform evolution modelling to understand potential erosion rates and refine the WRL and TSF closure designs, if needed.	Closure Manager	2025	
3	Mining void	Final abandonment bund location for South pit	Undertake a study to finalise abandonment bund strategy and confirm adherence to the relevant guidelines or otherwise confirm geotechnical stability. This study will be undertaken once the final South pit footprint has been confirmed.	Mine Manager	2027	
4	Mining void	Pit lake formation at closure	Review numerical groundwater modelling for South pit closure throughout LOM and update model calibration and monitoring bore inputs as appropriate.	Closure Manager	2027	
5	Tailings Storage Facility	Tailings consolidation post-closure	Determine the period required for the tailings to consolidate post-cessation of tailings deposition such that the tailings will have sufficient strength to be trafficable and allow rehabilitation earthworks on the TSF surface to proceed.	Mine Manager	2030	

[2] Progress has been included in the example table to align with example table presented in Guideline for Preparing Mine Closure Plans to allow for information presented in the MDCP to be incorporated into the MCP. It is noted progress may not be completed when presented in the MDCP.

The knowledge gap register developed at the project approval stage may contain broadly identified tasks and indicative timeframes that will need to 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.

9.3 Progressive rehabilitation and closure work schedule

It is essential to successful mine closure that rehabilitation activities are fully integrated into the day-to-day mining operations to ensure that materials and resources are available to undertake the work required progressively. Effective mine planning optimises opportunities for rehabilitation earthworks as areas become available, rather than undertaking large scale rehabilitation works at the completion of operations. Progressive rehabilitation activities may also involve research to close knowledge gaps and undertaking rehabilitation trials. Benefits of such activities include:

- Reduced financial liability under the Mining Rehabilitation Fund (MRF).
- Demonstration of responsible closure commitment to the community and regulators by reducing the unrehabilitated "footprint" of the mine.
- Better rehabilitation outcomes through learning from implementation efforts enabling continuous improvement.
- Costs of rehabilitation are managed throughout the life of the mine.

The MDCP must include details on the opportunities identified for progressive rehabilitation and closure works and how these have been integrated into the life of mine planning. It is acknowledged that mine plans evolve over time, and there can be a level of uncertainty associated with final state of mining activities. However, it is DEMIRS expectation that rehabilitation and closure tasks are undertaken progressively throughout the life of mine. Therefore, it is important that due consideration is given to scheduling of tasks at the approval stage.

Applicants should consider presenting the information as a rehabilitation and closure task register similar to the example shown in Table 15 below or presented using other project planning tools (such as GANNT charts).

Depending on the life of mine, the details on how progressive rehabilitation and closure works have been integrated into life of mine planning may contain the broader high level strategies and indicative timeframes that will be refined as part of the mine closure plan. For a short life of mine project, the closure implementation section may need to be more detailed with specific timeframes.

Table 15. Example of a rehabilitation closure task register.

Rehabilitation and closure task register					
Operational and progressive rehabilitation tasks					
#	**Domain**	**Works to be undertaken including Outcomes**	**Responsible Role/Owner**	**Timing**	Status[3]
1	Waste rock landform	Construct PAF material containment cell for North WRL	Mining Manager	2025	
2	Waste rock landform	Profile lower embankments of South WRL to design specifications	Mining Manager	2026	
2	Waste rock landform	Trial on ripping depth for South WRL	Mining Manager	2026	
3	Waste rock landform	Monitoring of Ripping Depth Trial on South WRL	Environment Manager	2028	
4	Mining void	Establish Abandonment Bund for South Pit	Mining Manager	2028	
5	Mining void	Backfill to surface North Pit	Mining Manager	2026	
Decommissioning and closure tasks					
#	**Domain**	**Works to be undertaken including Outcomes**	**Responsible Role/Owner**	**Timing**	**Status**
1	Plant	Demolition of Process Plant	Closure Manager	2035	
2	Plant	Contaminated Sites – Preliminary Site Investigation	Closure Manager	2036	
3	Mining void	Establish monitoring program of South pit for pit lake recovery and water quality	Closure Manager	2035	
Post-closure monitoring and maintenance tasks.					
#	**Domain**	**Works to be undertaken including Outcomes**	**Responsible Role/Owner**	**Timing**	**Status**
1	Mining void	Finalise Abandonment Bund for South Pit -Close haul road access points	Mining Manager	2036	
2	Waste rock landform	Monitor and remediate as required.	Mining Manager	Until completion criteria are met.	

[3] Status has been included in the example table to align with table presented in Guideline for Preparing Mine Closure Plans to allow for information presented in the MDCP to be incorporated into the MCP. It is noted status may not be completed when presented in the MDCP.

References

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Appendices

Appendix 1	Definitions and Acronyms
Appendix 2	Amendment to an existing Approvals Statement
Appendix 3	Mining Activity Categories
Appendix 4	DEMIRS Environmental Risk Assessment Framework
Appendix 5	DEMIRS Standard environmental and closure outcomes

Appendix 1 – Definitions and Acronyms

Term	Definition
Activity Envelope	The spatial extent within which the mining activities will be located.
Approvals Statement	As defined in Section 103AP of the *Mining Act 1978*. An Approvals Statement is a document that, in relation to a mining lease or a miscellaneous licence, records the following information: • an approval given to an activity on land the subject of the mining lease or the miscellaneous licence proposed in a mining development and closure proposal; • any conditions attached to the approval; • any relevant information; • the closure outcomes included in a mining development and closure proposal relating to the mining lease or the miscellaneous licence; and • the date by which a mine closure plan for the land the subject of the mining lease or the miscellaneous licence must be lodged.
As low as reasonably practicable (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 and monitoring occurs.
Closure Outcome	As defined in Section 103AA of the *Mining Act 1978*. Closure outcomes mean: • in relation to a mining development and closure proposal – the outcomes, objectives or goals to be achieved at the completion of the decommissioning of a proposed mine, and the rehabilitation of the land, the subject of a mining lease or a miscellaneous licence to which the mining development and closure proposal relates; and • in relation to a mine closure plan – the outcomes, objectives or goals to be achieved at the completion of the decommissioning of a mine, and the rehabilitation of the land, in respect of which a mining lease or a miscellaneous licence is granted.
Completion criteria	Agreed standards or levels of performance that indicate the success of rehabilitation, and attainment of closure outcomes and enable an operator to determine when its liability for an area will cease.
Consequence	The scale and type of effect of the potential impact on the environmental factor.
Conservation significant vegetation	Threatened and priority flora, fauna and ecological communities, locally endemic, range extensions, unusual or new species or species with a restricted distribution.
Consultation	A process that permits and promotes the two-way flow of ideas and information. Effective consultation is based on principles of openness, transparency, integrity, and mutual respect. Two-way communication is not just the issuance of letters or documents alone.
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.
DBCA	Department of Biodiversity Conservation and Attractions.
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety.
DEMIRS Environmental Objectives	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.

Term	Definition
Design report	The design report is a more complex and detailed report that presents an analysis of the background conditions and investigations undertaken when planning engineered landforms and structure such as a tailings storage facility (TSF). The design report is expected to evaluate: • variations in the surface and sub-surface profile, and their impact on physical and engineering properties; • specified design and operational parameters, including relevant tolerances and their impact on the integrity and performance of the landform/structure; • monitoring and inspection requirements; and • the proposed closure approach to be adopted. For further guidance on design reports for TSFs refer to the DEMIRS Guide to the preparation of a design report for tailings storage facilities (TSFs) (2015).
Detrimental impact	Causing harm or damage.
Disturbed	Area where vegetation has been cleared and/or topsoil (surface cover) removed.
Domain	A group of landform(s) or infrastructure that has similar rehabilitation and closure requirements and objectives.
DWER	Department of Water and Environmental Regulation.
Ecosystem	Means a dynamic complex of ecological communities and the non-living chemical and physical parts of their environment interacting as a functional unit.
Environment	As defined in the Mining Regulations 1981.
Environmental factor	A part of the environment that may be impacted by a mining activity
Environmental outcome	As defined in the Mining Regulations 1981.
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.
Groundwater	Water held underground in the soil or in pores and crevices in rock.
Growth media	Material identified as capable of supporting vegetation establishment.
Habitat	The area and resources used by a particular organism.
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.
Key mining activities	Defined as the following activity categories: • Evaporation pond. • Heap leach or vat leach facility. • Mining void. • Significant water diversion or management structure • Tailings or residue storage facility. • Waste rock landform or overburden stockpile. • Minerals-in-brine: ▸ Evaporation pond (minerals-in-brine). ▸ Halite/salt stockpile. ▸ Minerals-in-brin abstraction trench.
Key stakeholder	As defined in the Mining Regulations 1981.
Knowledge gap	The difference between what an operator knows versus what the regulator requires them to know.

Term	Definition
Level of risk	Magnitude of a risk or combination of risks, expressed in terms of the combination of consequence and likelihood.
Life of mine	Determination of the number of years a site will mine and process ore based on various input conditions, including economic, environmental and business considerations.
Likelihood	The probability of an activity impacting on an environmental factor to produce the predicted consequence.
Localised/local	The activity envelope plus adjacent study areas associated with the mining operation.
Maintain	To keep in existence or continuance, preserve, retain, or to keep in a specified state, position, etc.
Mine activity reference	Name given to a particular activity at the mine for ease of identification, for example "Western Waste Rock Landform" or "Tailings Storage One".
Mine Closure Plan (MCP)	A document defined under section 103AA, 103AN and 103AR to 103AT of the *Mining Act 1978*.
Mining Development and Closure Proposal (MDCP)	As defined in the *Mining Act 1978*.
Mining Operations	As defined in Section 8 of the *Mining Act 1978*. Mining operations means any mode or method of working whereby the earth or any rock structure stone fluid or mineral bearing substance may be disturbed removed washed sifted crushed leached roasted distilled evaporated smelted combusted or refined or dealt with for the purpose of obtaining any mineral or processed mineral resource therefrom whether it has been previously disturbed or not and includes — • the removal of overburden by mechanical or other means and the stacking, deposit, storage and treatment of any substance considered to contain any mineral; • operations by means of which salt or other evaporites may be harvested; • operations by means of which mineral is recovered from the sea or a natural water supply; and • operations by means of which a processed mineral resource is produced and recovered; • the doing of all acts incident or conducive to any such operation or purposes.
Other mining activities	Other mining activities incidental or conducive to the mining operations, including: • Fuel storage facility. • Workshop. • Landfill site. • Sewage pond. • Building (other than accommodation or plant). • Transport or service corridor. • Laydown or hardstand. • Core yard. • Topsoil stockpile. • Processing equipment or stockpile associated with basic raw material extraction.
Permanent	Irreversible changes to environment caused by the mining operation.
Phase of mine life	These phases include yet to commence, construction, operation, care and maintenance, rehabilitation and closure.
Pollutant	A substance that results in contamination of the environment, especially soil, water or atmosphere.
Post mining land use (PMLU)	Term used to describe a land use that occurs after the cessation of mining operations.
Potential zone of instability (PZoI)	The potential area of ground that can be disturbed by the failure of the open pit walls over the long-term.

Term	Definition
Problematic materials	Materials that have the potential to detrimentally impact on humans and the environment and require careful and appropriate management (e.g. Potential Acid Forming (PAF) materials, metalliferous materials, radioactive materials, asbestiform materials, dispersive materials, etc).
Processed materials	Waste materials generated from the onsite processing of ores.
Receptor	A biophysical entity which may be impacted by an aspect of the mining operation.
Recoverable impact	Impact that can be rectified to be consistent with prior environmental conditions.
Regional	The broader terrestrial area within which the mining operation occurs.
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. Rehabilitation can also include studies, trials and monitoring of trial performance that demonstrate the closure option for the site is achievable or closes knowledge gaps.
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.
Safe	A condition where the risk of adverse effects to people, livestock, other fauna and the environment in general has been reduced to a level acceptable to all stakeholders.
Sensitive Receptors	Sensitive receptors are environmental features that may have an increased sensitivity to contaminants. Examples may include: • Threatened Ecological Communities. • Priority Ecological Communities. • Public Drinking Water Source Protection areas With regards to water resources that are sensitive receptors, reference should be made to the Water Quality Protection Note (WQPN) 4: *'Sensitive water resources, for inclusion and definition of a sensitive water receptor'*.
Significant water diversion or management structure	Defined as significant infrastructure associated with the diversion, capture and/or transport of water flows such as diversion bunds higher than 3m, seawall and/or groundwater curtain.
Short range endemic species	Short Range Endemic (SRE) species are defined as terrestrial and freshwater invertebrates that have naturally small distributions of less than 10,000 km². Within this distribution, the actual areas occupied may be small, discontinuous or fragmented.

Term	Definition
Small mining operation	A small mining operation is defined as: 1. Scraping and detecting. 2. Dry blowing. 3. The following activities for a total footprint for the mining operation of 10 ha or less: i. Mining excavations (pits, costeans, quarries, shafts, winzes, harvesting, dredging), leaching operations and tailings treatment operations. ii. Any construction activities incidental or conducive to the activities above including plant, tailings storage facilities and overburden stockpiles. DEMIRS generally considers that a small mining operation does not involve the mining of uranium, mineral sands, or rare earth elements. The mining development and closure proposal pro forma for small operations cannot be used as a mechanism to seek approval for amendments to sites or projects that are not considered small mining operations.
Source of risk	Source of potential harm, or situation.
Stable	A condition where the rates of change of specified parameters meet agreed criteria.
Subterranean fauna	Subterranean fauna are defined as fauna that live their entire lives (obligate) below the surface of the earth. They are divided into two groups: • Stygofauna – aquatic and living in groundwater. • Troglofauna – air-breathing and living in caves and voids.
Surface water	Water that collects on the surface of the ground. May be pooled on the surface or composed lakes, creeks, and rivers.
Tailings Storage Facility (TSF)	An area used to store and consolidate processed materials (known as tailings).
Target Ecosystem	The specific biological community or environment that is to be achieved.
Unwanted event	A situation or condition where there is a loss of control of the hazard that leads to harm.
Waste rock landform	Areas associated with the storage of unprocessed subsurface or waste rock material resulting from a mining operation.
Water table	The level below which the ground is saturated with water.
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	To a greater extent than the activity envelope and adjacent study areas.

Appendix 2 – Amendment to an existing Approvals Statement

The guideline includes subheadings for each section that provides specific guidance regarding the level of detail/type of information to be presented when seeking an amendment to an existing Approvals Statement. This guidance has been consolidated into the table below for ease of reference.

This appendix should only be used when preparing an MDCP to seek amendment to an existing Approvals Statement.

Section of the MDCP	Guidance for amendments to an Approvals Statement
1. Description of proposed mining operation	
1.1. Mining operation description	The 'mining operation description' section should be updated as required to capture any new or modified mining activities, including how this changes the mining operation location, expected life of mine and closure of the site. It is recommended the applicant also clearly identify the new mining activities or changes to the activities for which approval is being sought.
1.2. Activity envelope	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.
1.3. Site plan	The site plan should be updated to clearly indicate the additional activities or changes proposed. If no change is required, the existing site plan should be included with a statement that there is no change from the previous plan.
1.4 Activity details	The activity details tables should be updated to detail the additional mining activities or changes required to existing activities recorded on the Approvals Statement. During online lodgement of the MDCP existing activity details tables will be available to edit and download for inclusion in the MDCP document.
2. Legislative framework	The legislative framework table should detail the relevant environmental approvals and statutory requirements that relate specifically to the additional mining activities or changes required. If no change is required, the legislative framework table should be included with a statement that there is no change to the existing legislative framework.

Section of the MDCP	Guidance for amendments to an Approvals Statement
3. Environmental data and analysis	
3.1. Environmental and social setting	The environmental and social setting section should be relevant to the proposed changes. If no change is required, the MDCP should state there is no change to the existing environmental and social setting.
3.2 DEMIRS environmental factors	The environmental data 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 environmental studies and ensure this information is incorporated into the MDCP. For minor amendments the MDCP should include the environmental data and analysis in the context of the new or changed activities proposed.
4. Stakeholder engagement	The MDCP should 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 there is no update to stakeholder engagement for this MDCP with appropriate explanation provided.
5. Post mining land use	The MDCP should still 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. The applicant must clearly demonstrate engagement with key stakeholders relating to any proposed changes. If no changes are proposed, then the post-mining land use section should state there is no change to the post mining land use.
6. Risk assessment and management	The risk assessment needs to focus on risk pathways associated with the changes being proposed. If these changes are substantial, 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 are adequately covered by a previous risk assessment in an MDCP and the existing environmental/closure outcomes, the "Risk Assessment and Management" section of the MDCP can state that there are no additional risk pathways, however, must also provide appropriate justification and explanation for this.
7. Environmental and closure outcomes	The MDCP should detail if changes are proposed to the environmental and closure outcomes recorded on the existing Approvals Statement. If no changes are proposed, the outcomes tables should be included with an appropriate explanation as to why there is no change required.
8. Monitoring	The MDCP should detail if the changes will result in a change to the existing monitoring framework. In particular, if changes to environmental and closure outcomes are proposed, the MDCP should indicate whether additional monitoring is required and provide details on methodology and monitoring frequency. If no change is required, the existing monitoring program should be included with a statement that there is no change.
9. Closure implementation	The detail presented in the closure implementation section should relate specifically to the additional mining activities or changes required. For example, for an MDCP seeking approval for an additional waste rock landform, the closure implementation section should present closure designs, knowledge gaps, progressive rehabilitation opportunities and contingencies for early closure or suspension of operations that relate specifically to the additional landform.

Appendix 3 – Mining activity categories

When preparing a MDCP, the following mining activity categories must be used when completing activity Tables 1 and 2.

Category	Key mining activity	Definition
Airstrip		The area specified for operation of an aerodrome and its traffic. This includes the active runway and any supporting infrastructure (such as weather stations and communications towers).
Accommodation village		Buildings and infrastructure associated with accommodation facilities.
Borefield		The area that contains the bores and associated infrastructure through which water (including brine) is extracted.
Borrow pit or shallow surface excavation		Surface excavations that are part of mining operations and extend no more than five metres below ground level. This includes (but is not limited to) shallow strip-mining and sand mining.
Dam		The area associated with storage of water or process liquor.
Evaporation pond	✓	The area associated with the storage of water or waste water for the purpose of treatment by solar evaporation. This does not include ponds created specifically for the production of harvestable product through evaporation (for example, for extraction of salts from brine or 'minerals-in-brine').
Heap leach or vat leach facility	✓	A facility used to extract minerals and/or other compounds from ore, either by 'heap leach' (that is, placing the ore on a liner and adding chemicals through drip systems) or by 'vat leach' (that is, by placing an ore slurry within a tank or vessel along with chemicals and mixing or agitating the solution).
Low grade ore stockpile		The area of land associated with the dry storage of ore of inferior grade or quality.
Mining void	✓	These are surface excavations that form part of mining operations and that extend at least five metres below ground level.

Category	Key mining activity	Definition
Other mining activities		Other mining activities incidental or conducive to the mining operations, including: • Building (other than accommodation or plant). • Core yard. • Diversion channel or drain. • Fuel storage facility. • Landfill site. • Laydown or hardstand. • Processing equipment or stockpile associated with basic raw material extraction. • Topsoil stockpile. • Transport or service corridor. • Sewage pond. • Workshop. • Transport or service corridor.
Plant site		The area of land that is required for the operation of machinery and equipment associated with the processing of minerals. A plant site may include, but is not limited to, a mill, concentrator, crusher, processing tank or vessel or a power station. It also includes storage areas for toxic or hazardous chemicals used in mineral processing. It excludes areas that are used for storage or processing of by-products or waste materials (which do not involve processing of minerals).
Renewable energy infrastructure		Infrastructure associated with the production, transmission, distribution and storage of energy based on renewable sources. This may include but is not limited to solar panels and associated convertor and substation and wind turbines and their associated transformer and substation.
Run of mine (ROM) pad		The area of land on which run-of-mine ore is deposited for grading or blending prior to processing.
Significant water diversion or management structure	✓	Defined as significant infrastructure associated with the diversion, capture and/or transport of water flows (e.g. diversion bunds higher than 5 m above the natural surface, seawalls and/or groundwater curtains).
Tailings and residue storage facility	✓	An area used to store and consolidate tailings.
Waste rock landform or overburden stockpile	✓	The area associated with the storage of unprocessed waste material produced by mining operations.
Minerals-in-brine categories		
Evaporation pond (minerals- in-brine)	✓	A facility created specifically for the production of a harvestable salt from brine through solar evaporation
Halite/salt stockpile	✓	The area occupied by the stockpile of excess halite or other mineral salts produced during the extraction of minerals from brine.
Minerals in brine trench	✓	The area of land occupied by a minerals-in-brine abstraction trench. In this context, an 'abstraction trench' is a trench excavated for the purposes of conveying abstracted brine to the evaporation pond network.

Appendix 4 – 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 the environmental factors, as established in the DEMIRS Environmental Objectives Policy, across all phases of mine life and that may arise from emergency conditions.

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

For mining operations within a Public Drinking Water Source Area, the risk assessment should consider the Department of Water and Environmental Regulation Water Quality Protection Note 77 – *Risk assessment process for public drinking water source areas* and *Water Quality Protection Note 11 – Assessing and managing risks in public drinking water source areas.*

The risk assessment process includes the following steps:

- Risk identification.
- Risk analysis.
- Risk Evaluation.
- Risk Treatments.
- Risk Register.

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

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 requires the description of the risk pathway is presented with three components:

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

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

- Seek advice from experienced operators, specialists, stakeholders, 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 an adequate and appropriate environmental understanding of the operating area, informed by baseline data and/or environmental data collected during operations, without which the risk pathways or potential impacts may not be identified. As detailed in the Environmental 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 data. Following collection of the environmental data, detailed analysis is required to establish the key environmental sensitivities and how these might be impacted by the proposed activities.

An example of how to appropriately identity risk pathways and potential impacts is provided in Table 1.

Table 1. Example of how to describe a risk pathway.

Risk pathway
Example 1 **Inadequate description of risk pathway:** • **Poor placement of mined materials during operations.** **Well defined risk pathway:** • **Poor placement of highly dispersive materials during operations leads to erosion and resulting smothering of native vegetation.**
Example 2 **Inadequate description of risk pathway:** • **Generation of acidic or metalliferous drainage.** **Well defined risk pathway:** • **Poor placement of PAF materials during operations leads to generation of acidic or metalliferous drainage which results in soil/water contamination and impacts on health of surrounding native vegetation.**

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 the DEMIRS standard consequence descriptors (Table 2). 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 the DEMIRS standard likelihood descriptors (Table 3). 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 the DEMIRS standard risk matrix (Table 4).

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 submission cannot be adequately assessed if the environmental 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 and actions added to the knowledge gaps table with actions to address the data gap.

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 need to be determined using the hierarchy of hazard control: eliminate, avoid, minimise or mitigate.

Generally, even a risk pathway with a low inherent risk level will still require industry best practice environmental management to be 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.

Risk Treatment

The risk assessment 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 ALARP and DEMIRS' objectives are met.

The selection of treatments should demonstrate the preferential application of the hierarchy of hazard 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 waste rock instead of constructing a waste rock landform.
3. **Control** the risk with an engineered solution. For example, having a specifically designed adverse materials management cell in a waste rock landform, 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.

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 only, not the consequence.

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, provide 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.

The risk register needs to detail how the risk treatments fit into the mitigation hierarchy. An example is provided in Table 5.

Risk register

The risk assessment should be presented in the DEMIRS standard risk register presented in Table 5. A copy of the risk register should be included within the submission. The register should be used to summarise all risk pathways identified for all phases of mine life and demonstrate how these risks can be adequately managed to as low as reasonably practicable and meet DEMIRS' environmental objectives.

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.

Risk treatments 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 may 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 initially appeared grossly disproportionate to the benefit may eventually become reasonably practicable.

Applicants will outline the environmental and closure outcomes that will be met to ensure the mining operation meets DEMIRS' environmental objectives. The risk assessment will identity the risk treatments/management required to be implemented to meet these outcomes. Applicants should continually review and improve environmental management to maintain residual risks at an ALARP level and ensure outcomes are met. 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

Where applicable, reference Australian Standards, code of practices and other established guidelines when describing risk treatments.

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 2. DEMIRS risk assessment framework consequence descriptors

Objectives and Environmental Factors		Environmental Indicator	Category Label				
Environmental Factor	**Objective**		**Insignificant**	**Minor**	**Moderate**	**Major**	**Severe**
Flora, vegetation and fauna	To protect flora and vegetation, subterranean fauna and terrestrial fauna so that biological diversity and ecological integrity are maintained.	Ecosystem function	Negligible impact/change to ecological processes and/or function.	Localised impact/change to ecological processes and/ or function resulting in a recoverable impact within 1 year.	Alteration to ecological processes and/or function resulting in a recoverable impact within 5 years. .	Alteration to ecological processes and/or function resulting in a recoverable impact within 10 years.	Alteration to ecological processes and/or function resulting in a potentially non-recoverable impact.
		Flora and vegetation	No direct loss of native vegetation although increased stress may be incurred through indirect or induced pressures. And/or No direct loss of conservation significant vegetation.	Localised and short-term (<1 years) loss of native vegetation which is widely distributed outside of the activity envelope.	Medium-term (1–5 years) loss of native 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.	Long-term (5–10 years) loss of native vegetation which is not widely disturbed outside the activity envelope. Project places significant pressure on continued survival of conservation significant vegetation on a regional scale.	Permanent loss of native vegetation causing significant pressure or potential extinction of conservation significant vegetation on a regional scale.
		Fauna	No decrease in fauna habitat and/or fauna abundance. And/or No direct loss of conservation significant fauna.	Localised and short term (< 1 year) decrease in fauna habitat and/or fauna abundance.	Medium term (1–5 years) decrease in fauna habitat and/or fauna abundance.	Significant, widespread, and/or persistent regional decrease in fauna habitat and/or fauna abundance. Long term (5–10 years) decrease in fauna habitat and/or 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.
Inland water	To maintain the hydrological regimes, quality and quantity of groundwater and surface water so that environmental values are protected.	Surface water quality	Negligible changes to local surface water quality that negatively impacts environmental values.	Minor and or short term (< 1 year) change to surface water quality that negatively impacts environmental values.	Moderate and or medium term (1–5 years) change to surface water quality that negatively impacts environmental values.	Long term decline (5–10 years) in surface water quality that negatively impacts environmental values.	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. Negligible impact to environmental values or water users.	Minor, short term changes to local surface water volumes. Recoverable within 1 year and/or localised impact to environmental values or water users.	Medium-term changes to surface water volumes. Recoverable within 1–5 years and/or negative impact to environmental values or water users.	Long-term changes to surface water volumes. Recoverable within 10 years and/ or negative impact to environmental values or water users.	Project causes permanent modifications to surface water volumes. Non-recoverable impact/ permanent impact to environmental values or water users.
		Ground water quality	Incidental, short-term changes to local groundwater quality. Negligible impact to environmental values.	Short-term (<1 year) localised decline in groundwater quality that negatively impacts environmental values.	Medium-term (1–5 years) localised decline in groundwater quality that negatively impacts environmental values.	Long-term (5–10 years) regional decline in groundwater quality that negatively impacts environmental values.	Permanent decline in groundwater quality that negatively impacts environmental values. Non-recoverable impact.
		Ground water quantity	Incidental changes to local groundwater levels/ availability. and/or negligible impact to environmental values or water users.	Local changes to groundwater levels/availability. Recoverable within 1 year and/or localised impact to environmental values or water users.	Changes to groundwater levels/ availability in the medium-term. Recoverable within 5 years and/or negative impact to environmental values or water users.	Regional changes to groundwater levels/availability in the long-term. Recoverable within 10 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.

Objectives and Environmental Factors		Environmental Indicator	Category Label				
Environmental Factor	**Objective**		**Insignificant**	**Minor**	**Moderate**	**Major**	**Severe**
Terrestrial environmental quality	To maintain the quality of land and soils so that 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. rectifiable within 5 years and results in minor 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, and/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, with consideration for cultural values 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) / perpetual management.
		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 minor rilling.	Post-mining landforms are generally stable, but may experience moderate erosion, such as limited gullying.	Post-mining landforms are unstable, with significant erosion, such as tunnelling and gullying, and/or subsidence.	Post-mining landforms are likely to fail (e.g. TSF embankment failure), with extensive ongoing management issues.
		Land contamination	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 3. Risk assessment framework likelihood descriptors

Descriptor	Operations		Closure	
	Frequency	Description	Probability[4]	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 times 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 times in 20 years.
Unlikely	Once in 20 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 times in 50 years.
Rare	Once in 50 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%	Unlikely but possible to occur/commence within a 100 year period from closure commencement. **AND/OR** Occurs 1 to 5 times in 300 years.

4 Probability is provided as alternative method to consider the likelihood of the risk event occurring post closure (closure timescale).

Table 4. 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 5. Risk register (including data entry examples)

Risk ID Number	Key Environmental Factor	Category Aspect(s)	Domain	Risk Pathway	Phase(s) of mine life	Inherent Risk			Risk Treatment	Residual Risk			Environmental or closure outcomes	Comments
						Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating		
1	Flora, vegetation and Fauna	Environmental threats	All	Vehicle and machinery movement introduce and spread weeds resulting in competition/ impact to native vegetation	Construction Operation Care and maintenance Closure	Moderate	Likely	High	Mitigate: Maintain data for location of recorded weeds. Periodically inspect weed risk areas. Implement vehicle/ machinery hygiene procedures to ensure vehicles and machinery are free of soil and vegetation/.	Moderate	Possible	Medium	F5. 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.	Weed surveys have been undertaken to determine presence and distribution of weeds.
2	Land and soil	Land contamination	Waste rock landform	Exposure of PAF materials to water and air during operations leads to generation of acidic or metalliferous drainage which results in soil/water contamination and impacts on health of surrounding native vegetation.	Operations Care and maintenance Closure	Major	Likely	Extreme	Control: PAF management plan implemented: During operations mined waste rock material with >0.2% sulfur identified and placed within PAF cell in centre of waste rock landform. Material covered with minimum 5m of NAF material.	Major	Rare	Medium	T1. Mined/processed materials managed to ensure any seepage and drainage is contained/ controlled so that environmental values are protected. C1. Constructed landforms are physically and geotechnically stable, minimise erosion and support native revegetation and/or the post mining land uses. C4. Constructed landforms are geochemically non-polluting.	Comprehensive waste rock characterisation studies completed to identify PAF material. High level of confidence.
3	Inland water	Surface water	Waste rock landform	Waste rock landforms block surface water flows to Smith Creek resulting in changes to surface waterflow and volumes.	Operations Care and maintenance Closure	Major	Likely	Extreme	Avoid/eliminate: Waste rock landform will not be constructed within 50 m of drainage lines identified within the activity envelope.	Major	Rare	Medium	W2. Surface water managed in a manner that prevents detrimental impacts to hydrological and ecological function and uses of surrounding surface water features and land. C6. Surface drainage patterns, flows and characteristics are reinstated in a manner consistent with the regional drainage function and/or post mining land use.	
4	Rehabilitation and mine closure	Physical and geotechnical stability	Waste rock landforms	Landforms placed within PZoI resulting in structural failure causing impacts to the environment.	Closure	Moderate	Likely	High	Avoid/eliminate: Waste rock landform will be not constructed within the PZoI.	Moderate	Rare	Medium	C2. The placement of mined materials/infrastructure in relation to excavations will be such that the final footprint after rehabilitation is not located within the potential zone of instability.	

Appendix 5 – 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
Terrestrial environmental quality	To maintain the quality of land and soils so that environmental values are protected.	Land contamination	T1.0	Mined/processed materials managed to ensure any seepage and drainage is contained/controlled so that environmental values are protected.
			T2.0	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	T3.0	Mined/processed materials managed to be safe and geotechnically stable.
		Soil resources	T4.0	Mining activities are managed to prevent erosion and sedimentation leading to detrimental impacts to the surrounding environment.
			T5.0	All suitable topsoil, growth media or rehabilitation resources being harvested, stored and maintained in a manner that allows for its successful use in rehabilitation.
Inland waters	To maintain the hydrological regimes, quality and quantity of groundwater and surface water so that environmental values are protected.	Surface water	W1.0	No contamination of surface water as a result of mining activities.
			W2.0	Surface water managed in a manner that prevents detrimental impacts to hydrological and ecological function and uses of surrounding surface water features and land.
		Groundwater	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 water users.
Flora, vegetation and fauna	To protect flora and vegetation, subterranean fauna, and terrestrial fauna so that biological diversity and ecological integrity are maintained.	Flora and vegetation	F1.0	Mining activities undertaken in a manner that avoids detrimental impacts to native vegetation outside of the activity envelope.
			F2.0	Mining activities undertaken in a manner that minimises detrimental impacts to native vegetation within the activity envelope.
		Fauna	F3.0	Mining activities undertaken in a manner that avoids detrimental impacts to native fauna outside the activity envelope.
			F4.0	Prevention of avoidable death or injury to native fauna from mining related activities within the activity envelope.
		Environmental threats (weeds and pathogens)	F5.0	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.
		Environmental threats (introduced Animals)	F6.0	No increase in the diversity or population of introduced fauna 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 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, with consideration for cultural values and without unacceptable liability to the State.	Physical and geotechnical stability	C1.0	Constructed landforms are physically and geotechnically stable, have minimal erosion and support native revegetation and/or the post mining land uses.
			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 potential zone of instability.
		Landscape	C3.0	Constructed landforms are designed with consideration of visual amenity, cultural values and local topography.
		Geochemical stability	C4.0	Constructed landforms are geochemically non-polluting.
		Land contamination	C5.0	All environmentally hazardous chemicals, rubbish and contaminating materials have been removed, treated, managed and disposed in a manner consistent with the post mining land use.
		Surface water	C6.0	Surface drainage patterns, flows and characteristics are reinstated in a manner consistent with the regional drainage function and/or post mining land use.
		Groundwater	C7.0	Pit lakes will not have a detrimental impact on 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.
		Flora and vegetation	C9.0	Rehabilitated land is consistent with agreed reference vegetation communities and/or with the post-mining land use.
		Fauna	C10.0	Rehabilitated areas provide habitat for native fauna, indicative of the target ecosystem and post-mining land use.
		Ecosystem function	C11.0	The rehabilitated ecosystem has function and resilience indicative of the target ecosystem and post-mining land use.
		Physical safety	C12.0	The rehabilitated landscape is made safe to humans and animals.
			C13.0	All underground workings are managed and closed to ensure long-term ground stability and prevent ground subsidence
		Infrastructure	C14.0	No infrastructure left on site unless agreed by post-mining land manager(s)/owner(s).

Government of Western Australia

Department of Energy, Mines, Industry Regulation and Safety

8.30am – 4.30pm

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