



LAND REHABILITATION PROCEDURE

MRL-EN-PRO-0009

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1. PURPOSE

Land disturbance and clearing is necessary to establish and operate mines and associated infrastructure. Land rehabilitation should form part of day-to-day management at mine sites whereby areas where activities are complete are progressively rehabilitated.

The purpose of this procedure is to encourage incorporation of mine rehabilitation in routine mining activities and to promote achievement of timely and successful rehabilitation.

The advantages of achieving a successful progressive rehabilitation program are often understated. These advantages include:

- Cost savings through:
 - Avoidance of double handling of materials;
 - Utilisation of equipment already mobilised onsite;
 - Refining rehabilitation techniques to avoid future rework;
 - Earlier relinquishment of tenements and fulfilment of obligations to the Mine Rehabilitation Fund (MRF); and
 - Minimisation of future monitoring and maintenance requirements.
- Reduced risk of regulatory non-compliance and legacy issues.
- Improved Government and community receptivity to future mining proposals and an enhanced public image and reputation.

2. SCOPE

This procedure applies to all Mineral Resources Limited (MRL) companies, its subsidiary company activities and all joint venture operations where MRL has substantial participation and/or management control.

Specifically, this procedure applies to all managers, supervisors or environmental specialists whose roles include rehabilitation of disturbed land at operating or closed mine sites. The procedure addresses the considerations for MRL employees when planning, implementing and monitoring rehabilitation works associated with mining operations.

The procedure does not provide technical guidance for rehabilitation which will vary from site to site.

3. DEFINITIONS AND ABBREVIATIONS

AER	Annual Environmental Report
ED	Environment Department
Environmental weeds	Introduced flora species identified as weeds within the local context. They are sufficiently vigorous to reduce the diversity and/or abundance of native species or adversely affect the function of natural ecosystems.
DMP	Department of Mines and Petroleum
Mine Plan	A plan or schedule for the mining of ore and waste rock.
Rehabilitation Plan	A site-specific plan that identifies the specifications for rehabilitation of each domain within the mine site.
Seed bank	Seed occurring at or immediately below the soil surface.
Subsoil	Soil layer immediately below topsoil. May have organic matter and some of the other biological characteristics of topsoil. Recovery depth usually ranges from 0.2 m to 1.0 m.
Topsoil	Surface soil containing organic matter, fungi and microorganisms and seed bank. Important for re-establishing vegetation on rehabilitated areas. Recovery depth usually ranges from surface to 0.2-0.5 m.
Weed hygiene	Management measures used to prevent the introduction or spread of weed species.
Woody debris	Cleared vegetation excluding any large timber.
MRF	Mine Rehabilitation Fund

4. RESPONSIBILITIES

4.1 Site Manager / Registered Manager

The Site Manager or Registered Manager is responsible for:

- Ensuring that mine rehabilitation forms part of the mine planning process.
- Ensuring that mine rehabilitation is progressively implemented as per the Rehabilitation Plan and, to the maximum extent possible, to minimise MRL's MRF obligations and its rehabilitation liability on the balance sheet.
- Ensuring works are conducted to a good standard that minimises any requirement for re-work and aims to meet the DMP's requirement for "safe, stable and non-erodible" landforms, the objectives of the Rehabilitation Plan and any specific criteria applicable to the site.

4.2 Mining Manager

The Mining Manager is responsible for:

- Considering rehabilitation requirements when developing, implementing or revising the Mine Plan.
- Assisting in development of a Rehabilitation Plan that can be used in conjunction with the Mine Plan to guide day-to-day activities.
- Identifying and acting upon opportunities to progressively undertake rehabilitation.
- Exploring opportunities for backfilling of waste rock to pit voids to avoid or minimise the construction of free-standing waste rock landforms.
- Ensuring any hostile materials representing a risk to the environment or human health are encapsulated or otherwise contained.
- Seeking continuous improvement in rehabilitation outcomes.

4.3 Environment Department (ED)

The ED is responsible for:

- Preparing and submitting Mine Closure Plans to the DMP, with input from the Mining Manager and other personnel as required.
- Providing technical advice to the Mining Manager on planning and implementation of mine rehabilitation.
- Developing a Rehabilitation Plan, consistent with commitments in Mining Proposals, the statutory Mine Closure Plan and best practice guidelines, to be used in conjunction with the Mine Plan
- Identifying and sourcing seed or tubestock.
- Managing topsoil and subsoil resources (where present) to ensure they are utilised efficiently, and to promote vegetation growth and reduce contamination, destruction, resource loss or weed presence.
- Identifying and sourcing soil amendments - fertiliser, gypsum etc.
- Making provision for and advise on any special requirements - use of woody debris, special measures to encourage fauna colonisation etc.

- Where required, obtaining specialist advice on matters related to rehabilitation and mine closure. These matters may include characterisation of materials, erosion control designs, techniques for establishment of vegetation or any other matter relevant to the successful completion of rehabilitation works.
- Auditing performance of rehabilitation earth works against the requirements of the Rehabilitation Plan.
- Monitoring rehabilitation (and associated analogue sites) and assessing against agreed criteria in approval documents.
- Reporting progress of rehabilitation work in Annual Environmental Reports (AERs), Mine Rehabilitation Fund (MRF) submissions and any other statutory reports required.
- Providing advice to the Mining Manager about the success of existing rehabilitation and any requirement for remedial work.
- Seeking continuous improvement in rehabilitation outcomes.

5. PROCEDURE(S)

5.1 Planning

Planning for rehabilitation works should be included from the project outset. Maximising planning reduces site disturbance, and ensures that materials such as waste rock and topsoil are placed close to their final location.

Key elements of planning for rehabilitation will include:

- Legal requirements (e.g. tenement conditions, Mining Proposal commitments, Mine Closure Plan requirements, Ministerial Statement conditions) and government guidelines.
- Development of achievable rehabilitation outcomes.
- Maximising mine planning and operations during active mine life for efficient resource extraction and post-mining land use (i.e. reduction of double-handling for waste materials and topsoil, and reduced areas of land disturbance).
- Material characterisation to identify future risks or opportunities for positive rehabilitation outcomes. Managing topsoil and subsoil resources efficiently, and identifying any potential deficits that would affect rehabilitation outcomes.
- Material scheduling, including topsoil, subsoil, competent rock placement, hostile materials (such as sulphidic waste rock or asbestiform materials) and opportunities for backfilling.
- Landform design, including location on the site, provision for drainage, erosion control, encapsulation of hostile materials, cover systems, final slope angle, lift height and berm width on landforms and type and depth of surface material (e.g. topsoil, rock armouring etc.).
- Surface treatments, including deep ripping of compacted areas, contour ripping of slopes, scarification etc.
- Species selection for seeding (assuming topsoil is either not used or cannot provide sufficient seed to achieve the desired outcome).
- Soil amendment requirements (e.g. gypsum, fertiliser, organic matter), if required.

- Consideration of site water balance and salt budget and potential effects on future rehabilitation or post-mining land uses.
- Any special requirements (e.g. measures to encourage fauna return, measures to establish particular plant species or ensuring heritage sites remain accessible).
- Research requirements - if established industry standards are not suitable for site conditions, it may be necessary to trial different techniques to assess their effectiveness, and to then consider the outcome of those trials in future rehabilitation work.
- Remedial work on unsuccessful historical rehabilitation and legacy sites which may be inherited from prior tenement/land owners.

5.2 Implementation

- Undertake rehabilitation progressively and in accordance with the Rehabilitation Plan.
- Monitor and report on the progress of rehabilitation.
- Audit site practices and compliance to the Rehabilitation Plan.
- Undertake remedial work, where monitoring identifies a risk to achieving the objectives of the Rehabilitation Plan.
- Record and archive accurate spatial data and other records of all work undertaken (see Section 6).

5.3 Inspection and monitoring

Inspections of rehabilitated areas must be conducted by ED to identify any instances where progress of the rehabilitation works is not satisfactory. These instances could include:

- Unforeseen safety issues.
- Erosion damage, especially as a result of significant rainfall events.
- Leaching of hostile materials and/or surface exposures of salts or other contaminated materials.
- Poor establishment of vegetation and/or loss of topsoil.
- Excessive grazing by stock or native animals.
- Excessive weed establishment.

Inspections should be conducted as rehabilitation works are being carried out and completed, and after rainfall events until such time as sale or relinquishment of the tenement is achieved. All inspections should be documented.

Most mine sites will be required to undertake some formalised monitoring. This may include monitoring the success or otherwise of trials and test work using different rehabilitation techniques. For more routine works, monitoring may include species presence and species cover, plant density, weed cover, erosion assessments and the effectiveness of surface water controls. In some circumstances, it could include fauna and water quality monitoring. At each site the ED must develop and implement a monitoring program based on:

- Obligations within tenement conditions, Mining Proposal commitments and industry guidelines.
- Completion criteria identified with the Mine Closure Plan.

Regular auditing of site practices to ensure they are compliant to the Rehabilitation Plan and that all opportunities to undertake progressive rehabilitation are being pursued.

5.4 Maintenance

The inspection and monitoring process may identify unsatisfactory aspects of rehabilitation works, as outlined above. Maintenance could extend to:

- Remedial earthworks to repair erosion damage or related failures.
- Reseeding where establishment of vegetation has been poor.
- Weed control.
- Feral animal control.
- Fencing to exclude animals or vehicles.

Remedial earthworks and reseeded should not be conducted without an understanding of the reasons why failure occurred and a reasonable expectation that further works undertaken will be successful. Specialist advice may be required.

5.5 Continuous Improvement

Across the industry, the outcome of land rehabilitation work is often unpredictable and there would be significant benefit in obtaining better, more consistent results. At every operation where land rehabilitation is a requirement, the Mining Manager and ED should:

- Explore opportunities to gain knowledge from others through attendance at rehabilitation conferences or workshops, or inspection of successfully completed works at other locations.
- Design and implementation of rehabilitation trials to address aspects of rehabilitation that have posed or are likely to pose difficulties in achieving the desired completion criteria.
- Entering into partnerships with research organisations to help achieve the most beneficial and cost effective rehabilitation outcomes for the business.

6. RECORDS

The following records and data should be maintained:

- Spatial (GIS) data relating to the location of planned or actual rehabilitation works, including the location of any encapsulated or hostile materials.
- Topsoil and subsoil inventories.
- Dates and details of rehabilitation works. Recorded information should include:
 - Equipment utilised (including tools and attachments), operating hours, volume of materials moved (i.e. waste rock, topsoil etc) and area rehabilitated (including type, i.e. slopes, batter etc)
 - Soil testing results;
 - Topsoil (and subsoil) resources used, including respread depths and methods of respread;
 - Seed mix used;
 - Seeding rate and extent of seeding;
 - Fertiliser or other soil amendments - type, application rate, extent of application;
 - Application of woody debris - rate and extent;
 - Physical works (e.g. depth of ripping).
- Inspections and monitoring data.
- Overall data requirements for AER and MRF submissions.

7. REFERENCES

Department of Industry Tourism and Resources	Mine Rehabilitation. Leading Practice Sustainable Development Program for the Mining Industry (2006).
Department of Industry and Resources	Safety Bund Walls around Abandoned Open Pit Mines - Guideline (1997).
Department of Mines and Petroleum, Environmental Protection Authority	Guidelines for Preparing Mine Closure Plans (2015).
Department of Mines and Petroleum	Guidelines for Mining Proposals in Western Australia (2006).
MRL-EN-PRO-0004	Land Clearing Procedure.