Your Guide To Mine Rehabilitation In Australia

What is mine rehabilitation?
Why is it important?
How is it regulated?
What are the new legislative changes?

This and more inside.
Key Facts

• Mines get abandoned for many reasons from changes in commodity prices, regulatory breaches, changes in policy and more.

• When mines get abandoned, taxpayers are burdened with the financial liability of rehabilitation. One such situation saw Kimberley Diamond leave the Western Australian government with $40 million in rehabilitation costs.¹

• A 2017 report found that there are more than 60,000 abandoned mine sites across Australia.²

• There are very few mines closed, rehabilitated and relinquished in Australia with a report finding most states had just 1 or none, South Australia being the only exception with 18.³

• To provide surety of cover for the cost of rehabilitation, authority holders lodge security bonds with the government which currently sits around $10 billion.⁴

• Western Australia, Australia’s biggest mining state, switched from individual mine-rehabilitation bonding in 2012 to a single fund that receives annual contributions from miners. As of 30 June 2017, this fund held $92.4 million.⁵

• Proposed reforms are underway particularly in Queensland, New South Wales and Victoria.
K2fly provides enterprise SaaS for Technical Assurance, Resource and Mineral Governance for leading mining and asset intensive companies to deliver ESG outcomes and net positive impact.

- Community & Heritage
- Land Access & Monitoring
- Ground Disturbance
- Dams & Tailings
- Mine Rehabilitation & Closure
- Resource Inventory & Reconciliation
- Block Model Management & Governance
- Automated Ore Blocking
- Mine Geology Data Management

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SECTION 1

What is mine rehabilitation?

Mine rehabilitation is “the process used to repair the impacts of mining on the environment. The long-term objectives of rehabilitation can vary from simply converting an area to a safe and stable condition, to restoring the pre-mining conditions as closely as possible to support the future sustainability of the site”.

Mining rehabilitation isn’t something that starts once a mine closes; it is something that commences before any mining activity begins and covers a range of activities. These activities include exploration, development, production, demolition, remediation of contaminated land and re-vegetation. Guidelines for conducting mine rehabilitation are provided at a state level, particularly those states with more intensive mining activities.

Examples of these guidelines for rehabilitation and mine closure include:

- Western Australia: Rehabilitation of terrestrial ecosystems: guidance for the assessment of environmental factors, Western Australia (WA EPA 2006) and Guidelines for preparing mine closure plans (WA EPA 2015)
- Queensland: Rehabilitation requirements for mining resource activities (EM1122) (DEHP 2014)
Mine rehabilitation targets and objectives

Setting mine rehabilitation objectives are essential to provide a basis for stakeholder input and consultation across all key stages. These objectives will typically vary between sites or within a single site. According to the Australian Government’s Depart of Industry, Innovation and Science⁷, may involve:

- the restoration or reclamation of the area so that the pre-mining conditions are replicated (75% of mines in Australia use native plant species because the establishment of native ecosystems gives the greatest chance of self-sustainability)
- rehabilitation to improve the pre-mining conditions (for example, some coal mining rehabilitation increases the livestock carrying capacity of the land)
- rehabilitation to a new landform, land capability or final land use (golf courses, wetlands, plantations, housing subdivisions and recreational playing fields have all been established on old mining sites)

The scale and type of mining impacts along with environmental factors affect a mine site’s ability to achieve rehabilitation targets. In Australia, many mine sites exist in environmentally challenging conditions where physical resources such as nutrient-rich soil and regular rainfall are limited. Therefore the likelihood of successful rehabilitation is difficult to predict when coupled with the scale of disturbance.
### The cost of rehabilitation

Figure 1 (right) highlights the relationship between the level of disturbance and realistic intervention, indicating the degree of change from the historical ecosystem and corresponding financial costs of rehabilitating affected lands. Source: modified from Doley & Audet (2013), Jackson & Hobbs (2009), Seastedt et al. (2008).  

<table>
<thead>
<tr>
<th>Level of Disturbance</th>
<th>Biotic changes</th>
<th>Abiotic changes</th>
<th>Changed biogeochemistry &amp; hydrology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prohibitive</td>
<td></td>
<td>Intermediate &amp; reversible disturbance // Modest to intensive rehab &amp; cost</td>
<td>Large and irreversible disturbance // Significant to prohibitive and rehab cost</td>
</tr>
<tr>
<td>Intensive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modest</td>
<td>Normal disturbance // Modest rehab &amp; cost</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Degree of change from historical system

- Near-natural
- Hybrid
- Novel

Level of Intervention

- Prohibitive
- Intensive
- Modest

Cost of Rehabilitation

Level of Disturbance
SECTION 2
Types and samples of mine rehabilitation

CROPPING Coal & Allied are rehabilitating land for crop production, producing a hybrid of wheat and rye. After three years of production, hay yields are now above the district average.

CONSERVATION Bluestone Mines and CSIRO have revealed a way to create a cap to exclude oxygen and neutralise water. Once implemented, water quality rapidly improved and environmental standards met.

GRAZING Glencore land is now used as a grazing pasture with cattle growing faster and averaging an extra 79 kgs over neighbouring pasture cattle. This returned a 25% price increase at the abattoir.

NATIVE RESTORATION Cristal Mining have re-established a semi-arid vegetation ecosystem with native flora species and native lizard and bird species now resettled in the area.
SECTION 3

The business case for mine rehabilitation

With increased regulatory pressure and greater environmental impact awareness and understanding, mine closure has become a crucial aspect of the success of any mining operation. According to the federal Department of Industry, Innovation and Science\(^\text{10}\), four key factors make up the business case for mine rehabilitation. These include project approval, compliance risk, financial liability and reputational risk.

**Project approval**
Mining companies need to demonstrate their commitment to land-use stewardship, stakeholder and community relations and sustainability to gain access to land. Mine rehabilitation efforts are now seen as a key performance indicator and a competitive advantage. Failure to properly consider and commit to mine rehabilitation and land-use stewardship can reduce the likelihood of receiving approvals or completing development opportunities altogether.

**Compliance risk**
Companies failing to meet regulatory requirements and expectations run the risk of increased scrutiny, additional restrictions and higher compliance and legal costs. One of the greatest compliance risks is a company losing its social license to operate (the acceptance of a company’s business practices and operating procedures by its employees, stakeholders and the general public), thus limiting its future access to resources.

**Financial liability**
Effective and early planning helps minimise rehabilitation costs as engagement, monitoring and collaboration with regulatory bodies can be improved. Failure to plan and manage these can see financial liabilities sky-rocket.

**Reputational risk**
A poor record of rehabilitation can lead to reputational damage with regulators and stakeholders. This can result in approval delays or rejection, more stringent permit conditions and the loss of a social license to operate. Companies with a positive reputation for rehabilitation, however, can utilise this advantage as a point of differentiation and may also see them become a development partner of choice with regulators and the community.
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Progressive rehabilitation

Companies who fail to consider or adequately plan for rehabilitation in the early stages of the project development, often see costly remediation outcomes. The number of mines closed and successfully rehabilitated and relinquished in Australia is very low across the states with the majority recording none or one.

<table>
<thead>
<tr>
<th>Mines closed, rehabilitated and relinquished</th>
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</thead>
<tbody>
<tr>
<td>Queensland</td>
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</tr>
<tr>
<td>Western Australia</td>
<td>Unknown</td>
</tr>
<tr>
<td>New South Wales</td>
<td>1</td>
</tr>
<tr>
<td>South Australia</td>
<td>18</td>
</tr>
<tr>
<td>Northern Territory</td>
<td>0</td>
</tr>
<tr>
<td>Victoria</td>
<td>1</td>
</tr>
<tr>
<td>Tasmania</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 2 (above): The number of mines closed, rehabilitated and relinquished by state and territory in Australia

Successful rehabilitation requires a continuous improvement focus, based on site-specific knowledge, research and monitoring. Opportunities and threats should be identified early so that mining operations do not reduce rehabilitation options. Thus, delayed investment leads to delayed relinquishment beyond the operational life of a mine, adding to cost and, in some cases, the retention of a liability for years longer than necessary.

FEDERAL DEPARTMENT OF INDUSTRY, INNOVATION AND SCIENCE
Closure planning and mine rehabilitation

Closure planning is a continuous process, and mine closure plans should be treated as living documents undergoing constant review, development and improvement across the lifecycle of a mine. The illustration below (source: Decipher) captures the types of activity required to occur across exploration, development, production and closure.
SECTION 5

What is the Government’s involvement?

The Australian Government is placing an increased focus and commitment to ensuring major mining projects use best practice rehabilitation so that the land can be repurposed once mining operations cease.

The Government acknowledges that aspects of the current regulatory framework for mine rehabilitation do not meet best practice. For example, development applications for major mining projects often lack required consideration and information on how land is going to be rehabilitated and transformed post-mining.

Also, concerns have been raised by communities regarding the assessment of final mining voids (the formation of pits as a result of displaced material as a result of open cut mining), including the lack of criteria to determine how a final void will be managed and what is deemed acceptable.

Reforms are needed to ensure rehabilitation and post-mining land uses are properly considered early in mine planning.

Modern regulation, including the requirement to lodge a security bond, means that mining operators are responsible for their own rehabilitation works.
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Legislative changes underway

On 8 February 2017, the Senate referred an inquiry into the rehabilitation of mining and resources projects as it relates to Commonwealth responsibilities to the Environment and Communications References Committee for inquiry and report by 23 August 2017. From 2017 to March 2019, seven ‘extensions to report’ were granted. In March 2019, an inconclusive report was delivered which revealed that the Senate committee had failed to agree on a way forward.

The Australian Greens made 32 recommendations focusing on a significant increase in Commonwealth involvement. These recommendations included making a complete inventory of mine sites, providing more research funding, creating enforceable targets, legal changes and the formation of a national management body. Reforms are now underway at a state level.
Mining rehabilitation reforms in Queensland

On the 14 November 2018, the Queensland Parliament saw the passing of the Mineral and Energy Resources (Financial Provisioning) (MERFP) Act 2018. This reform package is aimed at improving rehabilitation and financial assurance outcomes for the sector that aims to deliver:

• Improved environmental performance
• Rehabilitation investment in the Queensland resources industry
• Better protection of the State's financial interests

The MERFP includes provisions that will commence on the 1st April 2019, which according to the Queensland Government will:

• Replace the financial assurance arrangements for resource activities under the Environmental Protection Act 1994 with a new financial provisioning scheme, and change how the estimated rehabilitation cost for an environmental authority is calculated.
• Amend the Environmental Protection Act 1994 to introduce new requirements for the progressive rehabilitation and closure of mined land.
In November 2017, a discussion paper on ‘Improving Mine Rehabilitation in NSW’ was released with the goal being to receive feedback by 16 February 2018 on the core proposal reforms. These reforms include:

- A policy framework to assess final mining voids, where voids will not be considered in new major projects unless the void minimises environmental, community and visual impacts and cannot be feasibly removed
- Requirements for new major projects to consult with the community and provide information on mine design options early in the planning process i.e. as part of the Scoping Report (formerly known as the Preliminary Environmental Assessment)
- Requirements for new major projects to include standard land form and land use rehabilitation objectives in the development application
- Improved regulatory coordination across the assessment, operations and post-closure stages of the mine life cycle
A new bill was introduced in August 2018 to establish a new authority to manage mine closure and rehabilitation across Victoria.

Recommendations include:

- Marking out the rehabilitation, closure and post-closure requirements for certain mines
- Establishing clear responsibility for the post-closure management of rehabilitated mine land
- Establishing a Mine Land Rehabilitation Authority to oversee mine rehabilitation and post-closure management, including administration of post-closure funds from 1 July 2020

In March 2019, the Victorian government requested feedback across the resources sector and community on ways to shape new regulations as part of the Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2019 which aim to set clearer work plan and rehabilitation requirements to better manage risks associated with mining and minerals exploration. The reforms aim to help miners and explorers have the right regulations to manage sites as safely as possible and then leave them in the best state for the community once commercial operations cease.
SECTION 7

Who regulates mine rehabilitation in each state?

<table>
<thead>
<tr>
<th>State</th>
<th>Governing body</th>
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</thead>
<tbody>
<tr>
<td>Queensland</td>
<td>Department of Environment and Science</td>
</tr>
<tr>
<td>Western Australia</td>
<td>Department of Mines and Petroleum</td>
</tr>
<tr>
<td>New South Wales</td>
<td>Department of Planning and Environment</td>
</tr>
<tr>
<td>South Australia</td>
<td>Department for Energy and Mining</td>
</tr>
<tr>
<td>Northern Territory</td>
<td>Department of Primary Industry and Resources</td>
</tr>
<tr>
<td>Victoria</td>
<td>Department of Jobs, Precincts and Regions</td>
</tr>
<tr>
<td>Tasmania</td>
<td>Environmental Protection Authority &amp; Department of State Growth</td>
</tr>
</tbody>
</table>
SECTION 8

Mine rehabilitation case studies

- Newmont - Woodcutters
  Northern Territory

- Peabody - Wilkie Creek
  Queensland

- Alcoa - Huntly and Willowdale
  Western Australia

- New Hope - New Acland
  Queensland

- Royal Botanic Gardens
  Victoria
New Hope Group  
*Queensland, Australia*

Key Facts:

- Progressively rehabilitated since operations began in 2002
- Around 490 hectares of mined land is now rehabilitated at New Acland
- 240 hectares of the rehabilitated land is now used for grazing ~75-100 cattle
- Five years of scientific cattle grazing trials conducted on the rehabilitated land indicate cattle grazing on mined land perform as well, or better than, cattle on un-mined land
- Innovative cattle grazing trials and a local tree species planting program are also in progress
Newmont
Northern Territory, Australia

Key Facts:

• Took ownership of the decommissioned Woodcutters lead-zinc mine in the Northern Territory as part of its 2002 acquisition of Normandy
• Newmont has continued decommissioning, rehabilitation and monitoring activities at the site in partnership with the area’s Traditional Owners, the Kungarakan and Warai people
• Work is guided by the Woodcutters Agreement which details local employment, training and stakeholder commitments
• Newmont’s aim is to return the land to Traditional Owners when agreed closure criteria and objectives are met
Key Facts:

- Peabody has progressed rehabilitation of its Wilkie Creek site in Queensland’s Surat Basin following the completion of coal mining in 2013
- 60% of rehabilitation is now complete
- Rehabilitation includes backfilling of open cut voids, re-shaping of dumps and undertaking demolition
- The final landform planning process includes paddocks and cattle watering systems to support the end land use of grazing
- Extensive community engagement continues to inform the planning for post-mine land use with grazing trials, including more than 50 cattle on a rehabilitated backfilled pit, delivering positive results for neighbouring graziers
AngloAmerican - Dawson Mine
Queensland, Australia

Key Facts:

• Anglo American’s Dawson Mine pioneered the use of blasting techniques to successfully reshape void highwall into its final landform position in 2013
• Pre and post-blast surveying was undertaken to provide accurate estimates of how much reshaping and material was required for final landform
• The area was then seeded with a grazing mix of native and introduced species
• It was then treated with five tonnes per hectare of Gypsum in 2017 and re-seeded
• Monitoring will continue every three years and the area is expected to be ready for grazing activities in around four to five years
Alcoa Mines
Western Australia, Australia

Key Facts:

• Alcoa mines and rehabilitates approximately 600 hectares each year at its Huntly and Willowdale bauxite mining operations in the Darling Range in Western Australia
• Key objective is to restore 100% of the plant species that existed in the pre-mined jarrah forest within 15 months of rehabilitation
• Alcoa has established its own nursery
• Alcoa are working in collaboration with universities, government agencies and private researchers to understand the forest ecosystem
Cranbourne Gardens
Victoria, Australia

Key Facts:

• The site was previously used for sand mining from as far back as the 1820s, with private licences also issued for grazing and timber gathering
• It has since been transformed into a 363 hectare botanic garden and nature reserve of international standing
• It is recognised as a site of State significance for flora and fauna conservation, with over 25 species listed as endangered, threatened or at risk of extinction
• There are now ten kilometres of walking tracks, six kilometres of cycling tracks, a lookout tower, shelters, barbecues and picnic tables
• The Australian Garden, completed in October 2012, features approximately 170,000 plants from 1,700 plant varieties
SECTION 9
Driving progressive mine rehabilitation with K2fly

Until recently, mine rehabilitation has been an afterthought for the majority of mining companies.

K2fly enables companies to be forward thinking and progressive by enabling them to:

- Monitor vegetation health and performance through satellite indices such as Biomass (NDVI) and Red Edge (NDRE)
- Track and manage remote offset properties and compare vegetation performance against other domains
- Create management zones across project areas
- Create nutrition plans, application and requirements for rehabilitation domains
- Create and manage project boundaries, areas and/or domains and monitoring points
- Capture a wide range of environmental monitoring data and indicators such as water, air, noise, vibration and soil
- Analyse real-time environmental monitoring data in conjunction with satellite indices
- Maintain and track environmental monitoring compliance limits and any exceedances
- Add notes and annotations to the map to make data more meaningful
SECTION 10

Take action now

Please speak to our team of experts today about how we can assist you and your company in taking an integrated approach to mine rehabilitation, certification and compliance.

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REFERENCES


