

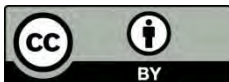
Risk and Prioritisation Framework for Abandoned Mine Management and Remediation

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This publication has been compiled by Tania Hall of Technical Services, Department of Resources.

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Executive Summary

The Queensland Government's Risk and Prioritisation Framework for Abandoned Mine Management and Remediation provides a transparent, robust and risk-based approach to addressing hazards associated with legacy mining.

The framework describes the context of legacy mining in Queensland and includes the rationale for classification of abandoned mine sites and the proposed interaction with Queensland's newly introduced Financial Provisioning Scheme for the resources sector.

It details the guiding principles and the three-stage risk assessment and prioritisation processes that the Abandoned Mine Lands Program (AMLPLP) will implement to mitigate identified risks in a consistent and repeatable manner.

The guiding principles recognise the critical role of competent risk assessment in identifying and analysing hazards and developing management and remediation solutions. The principles recognise the value of collecting, analysing and presenting abandoned mine data, and support stakeholder consultation and consideration of the historical, cultural, social, environmental, educational and economic value of abandoned mines in development of management options.

The three-stage process involves:

- preliminary screening through a desktop and spatial information review of all sites followed by a site field assessment
- a detailed site risk assessment by experienced and qualified personnel of public health and safety, environmental, social and property hazards identified during the preliminary screening
- prioritising sites for further investigation or remediation based on an aggregation of the cumulative number of high and extreme risks, with consideration to most imminent risks to public health and safety, serious environmental harm and property/social impacts

Once ranked, business cases will be developed to support funding applications to execute proposed site management, risk control and remediation options.

The Queensland Government has incorporated changes in the finalised framework reflecting stakeholder feedback to a consultation draft released in April 2020.

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Purpose

The Queensland Government has committed to delivering a transparent and accountable Abandoned Mine Lands Program (AMLP) including publishing information regarding the process for prioritising remediation of abandoned mines.

The Risk and Prioritisation Framework provides for:

- Achieving outcomes consistent with Queensland's Abandoned Mines Management Policy
- Identifying risks to public health and safety, environment and property associated with abandoned mines
- Prioritising abandoned mine remediation based on risks assessed in a consistent, repeatable manner against the AMLP criteria
- Ongoing monitoring, analysis and reporting of identified risks and benefits of AMLP mitigation activities.
- Assessing re-commercialisation and re-purposing opportunities for abandoned mines.

Background

The objective of the Department of Resources' AMLP is to mitigate risks posed by abandoned mines to public health and safety, the environment and property consistent with the State's Abandoned Mines Management Policy (see Appendix 1).

The *Mineral and Energy Resources (Financial Provisioning) Act 2018* came into force on 1 April 2019 and replaces the prior financial assurance arrangements for resource activities under the *Environmental Protection Act 1994 (EP Act)* with the Financial Provisioning Scheme (FPS). The primary objective of the FPS is to ensure adequate funding is available to undertake rehabilitation on current resources sites that may become abandoned in the future without rehabilitation being completed by the operator.

As result of the FPS, there will also be future opportunities to direct some of the funds held by the scheme to remediation of resource sites abandoned prior to the commencement of the FPS. The Risk and Prioritisation Framework for Abandoned Mine Management (Risk and Prioritisation Framework) presents the government's proposed approach to prioritising management of mines abandoned before the commencement of the FPS (termed pre-commencement abandoned mines).

Pre-commencement abandoned mines are further categorised as legacy mines, pre-commencement terminated mines and historic mine disturbances to more accurately reflect the scale and type of risks associated with these abandoned sites (refer to Glossary, Appendix 3). The focus of the Risk and Prioritisation Framework is on the larger and more complex legacy and pre-commencement terminated sites due to the complexity of risks and high potential remediation cost.

Remediation of post-commencement sites operating under the FPS will not fall under this prioritisation framework unless any associated financial surety allocated for the site has been exhausted without site remediation being completed.

Abandoned Mines in Queensland

Mines without mining tenure and an environmental authority are considered 'abandoned' and those abandoned prior to commencement of the FPS are further classified into one of three categories based on the timing of tenure termination, scale of disturbance and risk profile. These categories include legacy mines, pre-commencement terminated mines and historical mining disturbances. The defining characteristics of the three sub-categories are outlined in Table 1 below.

Around 100 complex legacy and pre-commencement terminated mines have been identified in Queensland (see the section *Desktop assessment and screening*). These are collectively referred to

as program sites and are the focus of the Risk and Prioritisation Framework (refer to the Glossary in Appendix 3.).

Table 1: Characterisation of legacy mines, pre-commencement terminated mines and historical mining disturbances

	Legacy Mines	Pre-commencement terminated mines	Historical mining disturbances
Description	Ceased production prior to the Environmental Protection Act amendments in effect 1 January 2001 and have features in common with a contemporary medium to large scale mine created by mechanised mining methods	Ceased production after the Environmental Protection Act amendments in effect 1 January 2001 without fulfilling rehabilitation obligations	Ceased production prior to the Environmental Protection Act amendments in effect 1 January 2001 and do not have features in common with a contemporary medium to large scale mine Characterised by small-scale, non-mechanised mining methods.
Approximate size	Small to very large	Small to very large	Very small to small
Approximate number	70	30	15,000+
Typical commodities	Precious and base metals, bauxite, tin and coal	All	Precious and base metals, tin, gemstones and coal
Features	Consistent with surface, underground or alluvial mining methods (e.g. open - cut mines, large underground developments, waste rock dumps, heap leach pads, crushing and processing plants, concentrators, smelters, and tailings storage facilities.)	Consistent with all mining and resource extraction methods (e.g. open-cut mines, underground developments, waste rock dumps, heap leach pads, crushing and processing plants, concentrators, smelters and tailings storage facilities.)	Consistent with surface and underground mining methods (e.g. small waste rock dumps, small shafts with minor underground workings, shallow pits and open or collapsed trenches)
Examples	<ul style="list-style-type: none"> • Mount Morgan • Mary Kathleen • Mount Oxide • Horn Island • Federation • Rishton 	<ul style="list-style-type: none"> • Linc Energy (Hopelands) • Collingwood Tin • Mt Chalmers • Wolfram Camp • Baal Gammon 	<ul style="list-style-type: none"> • Gympie gold fields • Charter Towers gold fields • Stanthorpe tin fields • Herberton tin fields
Assessed under Risk and Prioritisation Framework?	Yes (Program site)	Yes (Program site)	No, managed based on targeted risk based shaft remediation and small-scale work programs.

Historical mining disturbances

The State has previously identified more than 15,000 historical abandoned mine features across Queensland with the vast majority being very small mines established in the 'gold rushes' of the late 1800s to early 1900s with unsophisticated methods and relatively minor ground disturbance.

These sites lack characteristics of a larger contemporary mine and are collectively referred to as 'historical mining disturbances' and are managed through targeted (risk-based), low-cost remediation projects. As historical mining disturbances have less complex risk profiles and significantly lower

remediation costs, they are not considered in the overarching Risk and Prioritisation Framework and are managed under the AMLP's shaft remediation and small scale works program.

Legacy mines

The passing of the *Environmental Protection and Other Legislation Amendment Act 2000 (EPOLA 2000)* resulted in stricter environmental management and rehabilitation requirements for mining activities authorised under an environmental authority.

Mines relinquished or abandoned prior to the *EPOLA 2000* (in effect 1 January 2001) often had limited remediation requirements and the Department of Resources categorises these sites as 'legacy mines' due to limited decommissioning and/or rehabilitation obligations associated with past site operations. Legacy mines will be assessed under this framework.

Pre-commencement terminated mines

Pre-commencement terminated mines are those abandoned after amendment of the *Environmental Protection Act 1994* by the *EPOLA 2000* (in effect 1 January 2001) but prior to the commencement of the FPS. There are around 30 of these sites in Queensland. Pre-commencement terminated mines will be assessed under this framework. Pre-commencement terminated mines may have a financial allocation for rehabilitation through Financial Assurance allocated under the *Environmental Protection Act 1994*. For these instances, the Financial Assurance will be utilised as per legislative requirement before applying this framework.

Post-commencement terminated mines

Where a site is abandoned after the commencement of the *Mineral Resources (Financial Provisioning Scheme) Act 2018* (in effect 1 April 2019) rehabilitation works required at these sites will be funded through the FPS either through surety or the pooled FPS fund.

Where a resource site becomes abandoned and rehabilitation remediation is required, but is not a member of the FPS, the Scheme Manager may hold financial surety. The surety will be utilised to undertake site remediation. Where the surety is exhausted before full site rehabilitation is undertaken, the site will be assessed using this framework.

For the purpose of this framework, pre-commencement terminated mines and legacy sites will be collectively referred to as Program sites.

Abandoned Mine Lands Program

The AMLP seeks to identify and mitigate risk to public health and safety, the environment and property in line with the objectives of the Abandoned Mines Management Policy and funding provided by Government.

Typical examples of the activities undertaken through the AMLP include, but are not limited to:

- Historic shaft remediation programs
- Collingwood Park monitoring and state guarantee response
- Abandoned mine monitoring and assessment
- Disposal of abandoned plant and equipment by auction or other mechanisms
- Decommissioning and demolition of abandoned infrastructure
- Disturbed land remediation activities, including earthworks, revegetation, clean-up of contamination and water management
- Management of indigenous and non-indigenous cultural heritage issues,
- Stakeholder consultation.

These works benefit the community in a variety of ways, such as eliminating (or restricting access to) physical hazards and improving air and water quality for adjacent landholders and communities by the removal and/or reduction of contaminants.

It is important to ensure that abandoned mine sites are remediated on a risk-prioritised basis and that this approach is robust, transparent and consistent.

Imminent high-potential safety risks and emergencies affecting abandoned mines will be addressed outside of this framework as required to ensure timely management.

Guiding Principles

The following guiding principles support the Risk and Prioritisation Framework.

Risk management

- Risks to public health and safety, the environment and property from abandoned mine features are identified and analysed to inform remediation solutions.
- Remediation planning considers individual and cumulative risks from significant features.
- Risks may be grouped into manageable categories to prioritise them where a large number of potential hazards are identified at a mine.
- Risk controls will be evaluated with consideration of likelihood of success, cost benefit of remediation or re-purposing options, potential for long-term benefit and legal requirements, including land tenure, and stakeholder views to determine an overall site priority.
- Remediation solutions will achieve outcomes that are safe, secure, durable and productive.
- Mine site risk profiles are reviewed as remediation works are completed and/or additional information becomes available to inform the risk analysis.

Valuing abandoned mine sites

- Historical, cultural, social, environmental, educational or economic value of abandoned mines are considered when developing management and/or remediation plans.
- Approved management and/or remediation work will have a clear community or environmental benefit.
- Cost-sharing arrangements may be considered on a case-by-case basis where management strategies create a commercial benefit (i.e. through re-purposing).

Data collection, management and sharing

- Data collection and management will allow for improved understanding and comparative analysis on all relevant aspects of an abandoned mine, and reporting of information in a consistent way.
- Spatial data will be used for pre-screening and informing risk rankings on a regional basis.
- Information on leading practices, remediation and monitoring outcomes will be shared and reviewed regularly to support continuous improvement.
- A summary of information regarding the identification, site risks, level of priority, management and/or remediation of abandoned mines will be publicly accessible.

Resourcing and stakeholder engagement

- Stakeholders will be consulted concerning site management and the development of remediation goals.
- Partnerships with other government bodies, businesses and community groups will be encouraged where possible.
- Resources will be focussed on addressing priority risks.

Governance

- A formal, transparent governance structure exists to support management and/or funding decisions, track spending and clearly define responsibilities.
- Management and/or remediation of abandoned mine sites will be cost-effective.
- A robust project management and contractor management framework will support implementation of remediation projects.

Risk and Prioritisation Process

The Risk and Prioritisation Framework supports the implementation of the Abandoned Mines Policy and effective use of AMLP funding. The framework involves a three-stage process incorporating preliminary screening, risk assessment and prioritisation.

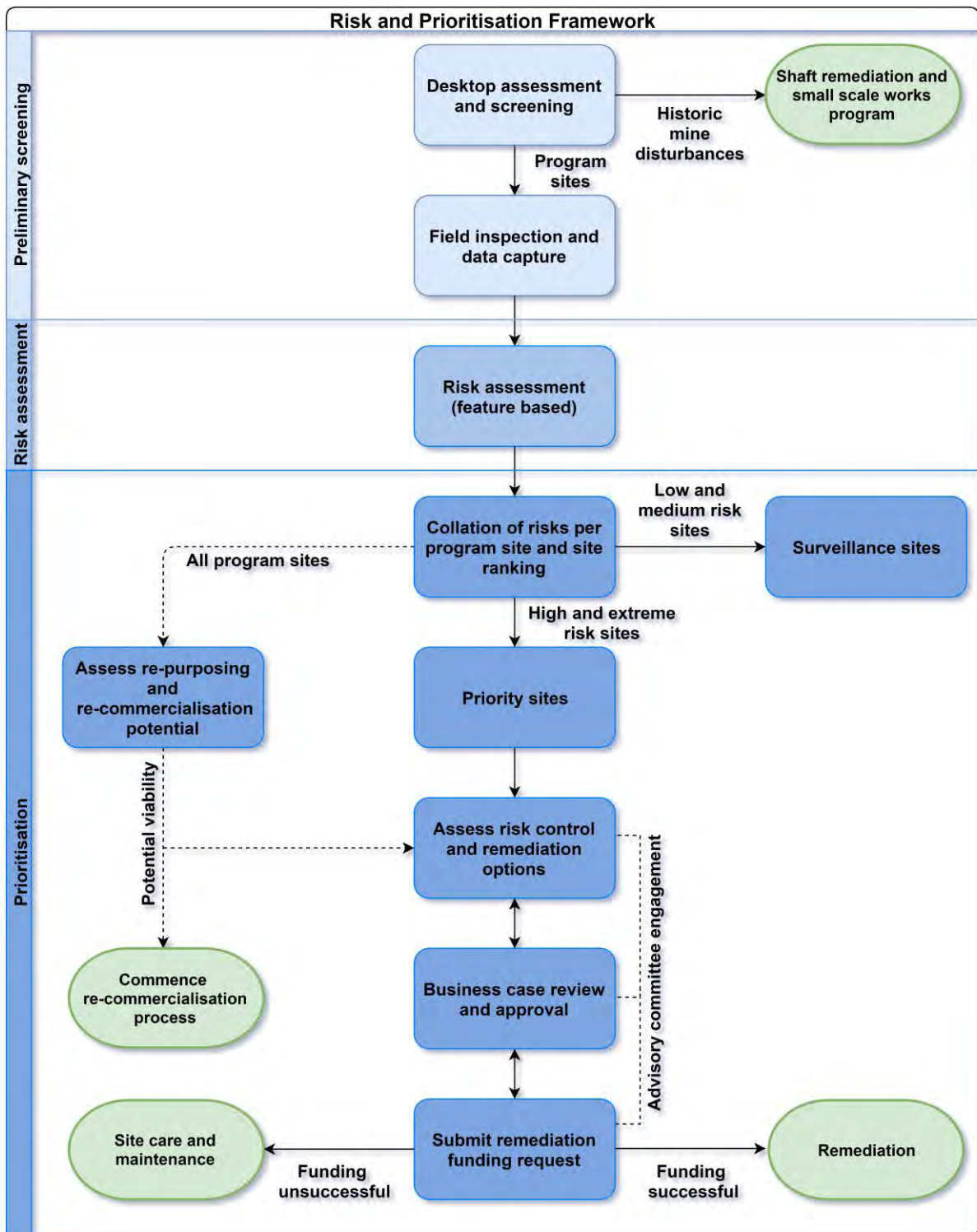


Figure 1: Risk Assessment and prioritisation process

Preliminary screening

Preliminary screening involves a desktop and spatial information review of all sites followed by a site field assessment to collect relevant information in advance of a detailed site risk assessment.

Desktop assessment and screening

Desktop assessment and screening filters out sites where only exploration and/or small-scale activities such as historic mine disturbances have occurred and involves:

- Reviewing the Geological Survey of Queensland's mineral occurrence data (*MINOCC data*) which identifies some 15,000 sites of potential interest
- Reviewing historic and current resource permitting information, imagery and topographic mapping to evaluate mine-related disturbance at each site.
- Reviewing information held across government including site reporting, documentation relating to Environmental Authorities, mineral resource information and existing government knowledge
- Excluding mines without current mining tenure but which have a current Environmental Authority (EA), or conversely mines with a current mining tenure but without an environmental authority
- Excluding historic mine disturbances suitable for management through AMLP's shaft remediation program.

While the process is dynamic, desktop assessment and screening has identified around 100 complex abandoned mines (program sites) targeted for field inspection. These program sites have higher potential for impacts based on factors including potential for contamination of water or soil, proximity to and/or accessibility by communities and higher-risk features including open pit walls, tailings storage facilities and mineralised waste materials.

Shaft remediation and small-scale works

Historic mine disturbances are managed through the shaft remediation program whereby risks are assessed on a program-based approach. Shaft remediation programs within the Gympie and Charters Towers shaft remediation areas are managed based on community safety risk.

Public safety risks posed by open underground or historic mine features outside of these areas are managed based on public concern and a Geographical Information System (GIS) risk model. The GIS risk model utilises the state-wide Mineral Occurrence (MINOCC) dataset to aid in the identification of high safety risk sites in proximity to populations and accessible locations. Each historic mine disturbance is allocated a risk value based on a weighted criteria that includes feature type, proximity to road class and type and proximity to population centre and size. The GIS risk model allows high-risk areas to be assessed via field assessment and remediation programs implemented on a regional or program based approach. Historic mine disturbances are not considered any further in this framework.

Where there are multiple small sites in a confined area that have potential cumulative impacts, these areas of disturbance may be grouped into an overall program site assessed under this framework.

Field inspection

Field inspections involve collecting detailed feature information and photographs using an electronic field-mapping tool.

Field inspections may also include environmental, geochemical and geological sampling to inform of potential risks or residual mineral resource potential at the site. Spatial data concerning significant features and infrastructure such as waste rock dumps, open pits, tailings storage facilities and processing infrastructure are also collected.

Stakeholder engagement commences during field assessments to contribute local knowledge to ensure an adequate understanding of site risks from a local perspective.

Data management

An Abandoned Mines Data System is being developed to capture information collected during the desktop assessment and field inspections and inform the risk and prioritisation process. The database will mature as further information is collected from various sources and verified. Spatial information from this data system will be made publicly available via the Department of Resources' GeoResGlobe.

Risk assessment

Appropriately experienced and qualified personnel complete a semi-quantitative risk assessment of public health and safety, environmental, social and property hazards identified during the desktop assessment and field inspection using established methodology aligned to *ISO31000:2018 Risk Management Guidelines*.

The risk assessment provides a “coarse grain filter” to prioritise sites and features that present the highest public health and safety, environmental, social and property risks based on likelihood and consequence criteria defined in the AMLP risk assessment process (refer to Appendix 2). The consequence criteria considered in this process include multiple attributes across a range of categories including:

- Public health and safety - considers potential onsite and offsite community health and safety impacts
- Social/property - considers amenity and economic factors, cultural heritage and impacts to public and private property
- Environmental - considers environmental impacts and remediation required to address those impacts.

Each risk assessment considers the attribute of the risk, consequence and likelihood of a potential hazard occurring, effectiveness of current controls/treatments and additional controls/treatments that might be required. Risk assessments are based on the features at the site and are later collated per mine site to form a site risk register.

The likelihood and consequence of a risk occurring are used to determine the risk rating, which is ascertained using a detailed 5 x 5 matrix. A summary of the consequence criteria, the likelihood categories and the 5 x 5 matrix are in Appendix 2. The consequence criteria, likelihood categories and 5 x 5 matrix are aligned with Department of Resources' risk management system, the Abandoned Mines Management Policy (Appendix 1) and *ISO31000:2018*.

Personnel undertaking the risk assessments are technical officers formally trained in risk management. Risk assessments take into consideration views from stakeholders and field observations, supported by analysis of environmental samples or engineering advice where required. Detailed Risk Management Procedures have been developed to support this framework for Department of Resources use and specifies the risk management training required for staff undertaking risk assessment workshops.

Prioritisation assessment

The site risk register classifies potential hazards from low to extreme risks. Sites with features that are low to medium risk are classed as surveillance sites. Sites with features that are high and extreme risk are classed as priority sites and are subject to further prioritisation.

Examples of high to extreme risks typical of a priority site include:

- Serious public health and safety risks associated with dangerous plant and structures, pits, shafts, adits, dams, ponded water and hazardous contamination with the potential to adversely impact community health and wellbeing, or restricting beneficial or productive use of surrounding land and waters
- Environmental risks associated with adverse impacts on ecological features of high conservation or scientific value.

Further detailed evaluation of high and extreme risk is required to assess the overall site priority. These assessments consider the potential individual and cumulative impacts of significant high-risk features at each site.

High and extreme risks are aggregated for each priority site, with the cumulative number of high and extreme risks used to determine an overall site ranking with consideration to most imminent risks to public health and safety, serious environmental harm and property/social impacts.

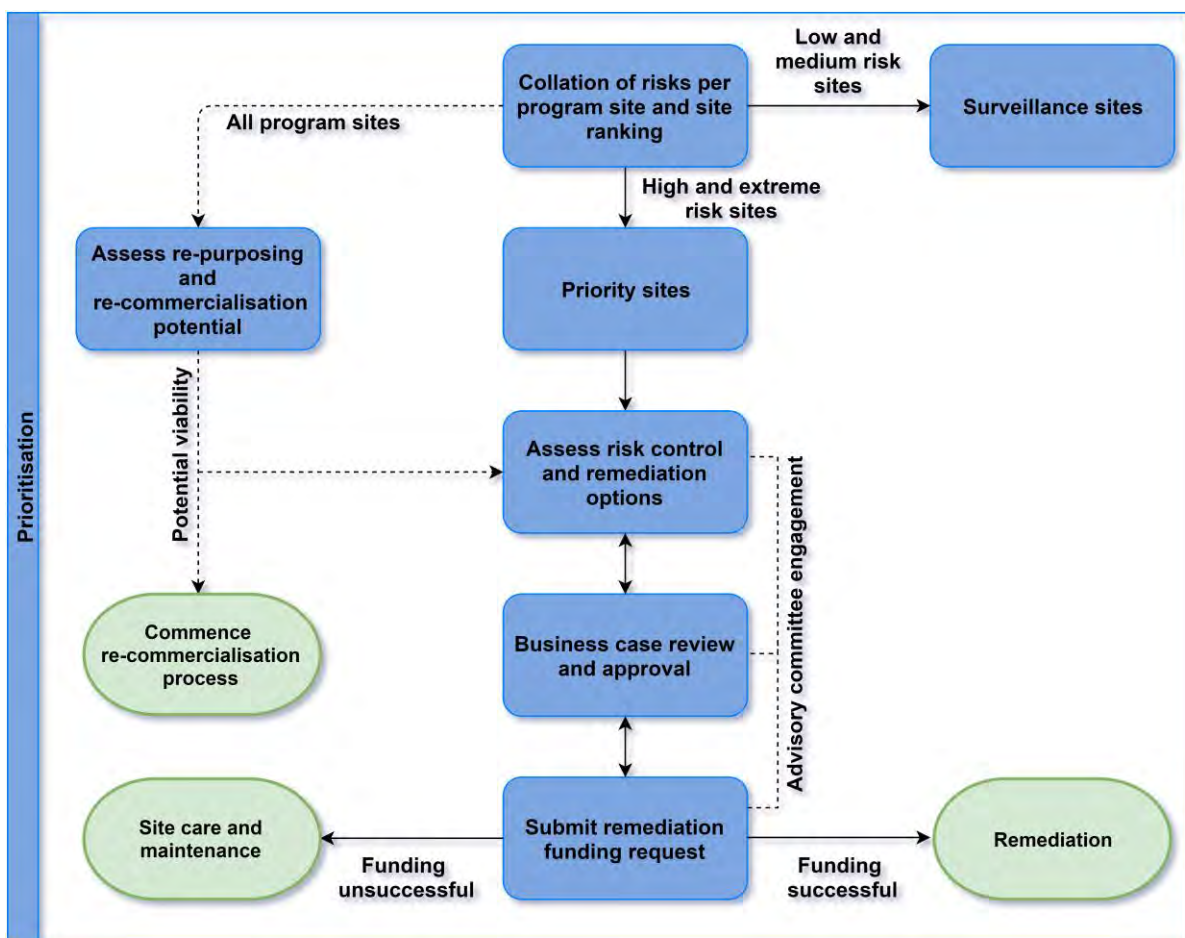


Figure 2 Prioritisation Flowchart (Excerpt of Figure 1 – risk and prioritisation process)

Risk control and remediation options

Developing risk control and remediation options is the process of identifying, selecting and implementing risk response plans to risks identified within priority sites.

Control measures to eliminate or lower the level of risk are categorised according to the ‘hierarchy of control’ (Figure 3). Control measures will be considered in preferred order as per Figure 3.

For extreme and high risks, the hierarchy of control should be focused at the higher end of eliminating and or minimising risk through engineered solutions.

Risk controls will also be evaluated through consideration of the following criteria:

- Likelihood of success
- Cost benefit of implementation
- Timing required for design and implementation
- Potential for long-term benefit
- Legal requirements, including land tenure
- Stakeholder views
- Historical, cultural, social, environmental, educational or economic value
- Remediation solutions that achieve outcomes that are safe, secure, durable and productive.

It may be necessary to take a phased approach to the design of risk controls particularly given the complexity associated with high-risk features. Where there is uncertainty in the risk analysis or with the control options additional technical studies may need to be commissioned to inform these decisions.


Most Effective	Hierarchy of control	Order of choice	AMLP example
	ELIMINATE		
	1 Eliminate the hazard <i>Remove it completely</i>	<i>Physically remove the hazard if practical</i>	<i>Dismantling plant and equipment</i>
	MINIMISE		
	Substitute Wholly or partly with a safer alternative 2 Isolate Using physical barriers, distance or time Engineering controls Adapt tools or equipment to reduce risk	<i>Minimise the risk, as far as reasonably practicable by taking the following actions where appropriate</i>	Water treatments for acidic waters <i>Cover system placed on a waste dump</i> <i>Fencing around voids</i> <i>Erosion control</i> <i>Water Treatment plant</i>
3 Administrative Controls Develop methods of work, processes and procedures	<i>Minimise the remaining risk as far as practicable</i>	<i>Signage</i>	
4 Personal Protective Equipment (PPE)	<i>If a risk remains, minimise exposure to those exposed to the risk</i>	<i>Protective clothing</i>	
Least Effective			

Figure 3 Hierarchy of control applicable to AMLP

Assess re-commercialisation and re-purposing potential

Abandoned mine program sites will also be assessed against the AMLP's re-commercialisation and re-purposing criteria. The criteria are used to evaluate the mineral resource potential of waste material and unmined resources or feasibility of alternative non-mining re-purposing opportunities.

The re-commercialisation assessment considers available mineral resource information and other data to score the re-commercialisation potential as a trigger for further investigation. The assessment process does not include undertaking feasibility studies for mineral resource development, it identifies opportunities to seek industry interest or collaboration to progress opportunities. Where relevant, re-commercialisation opportunities will be included in business case considerations.

The re-purposing assessment utilises site information to rate the site's potential for beneficial alternative industrial re-use, such as renewable energy projects or quarrying. Where relevant, re-purposing opportunities will be included in business case considerations. Non-industrial beneficial uses of abandoned mines are also considered including education, research, tourism and heritage. Where there may be potential for re-commercialisation or re-purposing, expressions of interest may be sought from relevant parties. See figure 4 for an overview of information assessed to determine a site's potential for re-commercialisation or re-purposing potential.



Figure 4: Overview of abandoned mine re-commercialisation and re-purposing criteria

Business case review and approval

The business case to support funding applications to execute proposed site management, risk control and remediation options will incorporate the outcomes of the risk and prioritisation assessment as well as the re-purposing and re-commercialisation processes. Business cases will also consider additional factors such as likelihood of success, beneficial land-use potential, cost effectiveness, potential for long-term benefit, stakeholder views, innovation, regional employment opportunities and legal and tenure-related issues where relevant. Benefits such as those that may arise through community partnerships and/or collaboration will also be considered at this stage.

Business case development and remediation of sites may be an iterative “staged” process. For example, initial applications may seek funding to complete engineering options assessments while subsequent applications may seek funding to execute options identified in those earlier assessments.

The FPS Advisory Committee will be consulted regarding business cases for funding sought from the Scheme. Procedures regarding funding submissions to the FPS Scheme will be developed in consultation with the Advisory Committee and the Scheme Manager.

Communication and Consultation

For each program site assessed the relevant stakeholders for each site will be considered on a case-by-case approach. Stakeholder interest will be assessed against the risk’s impact on Department of Resources priorities and the priorities of other stakeholder groups. Where funding is allocated for specific projects and remediation option assessments, a site-specific stakeholder engagement plan will be developed for that site.

Table 2 is an example of the types of stakeholder groups that may be considered for a particular program site and the types of priorities that may need to be considered.

Table 2 – Summary of key stakeholder types

Stakeholder	Objectives
Department of Resources	<ul style="list-style-type: none"> • Manage Queensland’s land, water, mineral and energy resources to optimise sustainable development outcomes • Deliver safe, secure, affordable and sustainable energy and water resources • Engage the combined expertise of Traditional Owners, community, industry and government to optimise the management and use of our natural resources • Mitigate risk of/responsibility for environmental/cultural/social impacts • Comply with regulatory requirements • Mitigate the risks associated with abandoned mines based on priority and risk • Undertake works to make abandoned mines safe, secure, durable, and productive
Other Government Agencies	<ul style="list-style-type: none"> • Protect the environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains ecological processes • Cultural heritage preservation • Compliance with legislation frameworks and policies
FPS Advisory Committee	<ul style="list-style-type: none"> • Manage the Financial Provisioning Scheme within regulatory framework • Provide future funding for remediation of abandoned mines on a prioritised basis • Provide future funding for research and development on mine rehabilitation
Community	<ul style="list-style-type: none"> • Mitigating impact on leasehold or private land, business enterprises and property (including landholders) • Mitigating impact on indigenous/non-indigenous culture, safety and community wellbeing • Preserving and mitigating impacts to the natural environment • Generating new employment and business opportunities • Local workforce/business participation in any remediation/ rehabilitation

Non-Government Organisations	<ul style="list-style-type: none"> • Welfare and or advocacy work in relation to a specific issue or in respect to social groups, the vulnerable or environment. • Indigenous NGOs – strengthen political and economic influence within a region • Undertaking research, advocacy, campaigning, fundraising, or providing aid for a specific cause
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Remediation

Following the risk and prioritisation analysis and identification of potential remediation strategy proposals of high priority abandoned mine features, proposals will be submitted to either the Financial Provisioning Scheme or Cabinet Budget Review Committee (consolidated revenue/government funding) for funding.

Approved projects will be executed through the Department of Resources project governance framework. This framework incorporates best practice project management elements including planning, procurement, contractor management, reporting and closeout, and safety management systems.

A post-implementation review will evaluate achievement of objectives, outcomes and outputs, and the performance regarding time, budget and benefits. A summary of this review for significant projects will be published via an annual report.

Additional sites

Through the Queensland Government website, an email notification service is available enabling the public to report an abandoned mine or concerns relating to an abandoned mine.

Notified sites will be assessed as per this framework including desktop review, with subsequent field inspection and risk assessment where required.

Summary

The three-stage process incorporated in the framework will ensure hazards at abandoned mine sites are assessed, recorded and prioritised in a repeatable consistent manner. The framework will guide decision-making by the Queensland Government to prioritise, manage and remediate abandoned mines ensuring effective use of the funding allocated to the AMLP to mitigate risks.

Detailed procedures have been developed to support abandoned mines personnel in the implementation of the framework. Upon implementation, the framework and risk process will undergo continual review to ensure achievement of the objectives and outcomes. Abandoned Mine Lands Program outcomes and achievements will be published in an annual report available on Department of Resources' website to commence in 2021.

Appendix 1 Abandoned Mines Management Policy (Published 1st October 2019)

ABANDONED MINES MANAGEMENT POLICY

The Queensland Government protects public health and safety, property and the environment by minimising the risks and impacts of abandoned mines. We do this by undertaking prioritised works through the Abandoned Mine Lands Program (AMLP) to make abandoned mines safe, secure, durable and, where possible, productive.

For over 150 years, mining has played a significant role in the history of Queensland and during that time mines have been abandoned. These mines can create potential risks to community health and safety and to the environment.

To mitigate the risks associated with abandoned mines, the Queensland Government has established and will progressively enhance the AMLP.

Under Queensland law, a mine is considered as abandoned when there is no longer a current mining tenement nor environmental authority in place. In 2018 DNRME identified approximately 120 priority abandoned mines with a combined area of disturbance of about 10 300 hectares as well as a further estimated 15 000 small scale historic mining disturbances.

The purpose of the AMLP is to undertake works to make abandoned mines safe, secure, durable, and productive by:

- preventing potential exposure of the surrounding community to hazards on an abandoned mine site by removing or mitigating hazards (**Safe**).
- implementing control measures to limit the level of adverse impacts to the surrounding and downstream environments (**Secure**).
- minimising the ongoing maintenance and monitoring requirements for a site—this includes geotechnical and geochemical stability (**Durable**).
- investigating opportunities to commercialise abandoned mines and/or repurpose the land for a future appropriate use, considering the economic, community, cultural, and conservation values and constraints of the site (**Productive**).

In determining the allocation of resources to remediate abandoned mines, work will be prioritised based on risk to community health and safety, the environment and property.

To deliver a transparent and accountable AMLP, the Queensland Government will publish information on processes for prioritising remediation works and planning activities as well as regularly reporting on progress on specific works and activities.

A cornerstone of the AMLP will be that communities and stakeholders affected by abandoned mines are consulted on abandoned mines impacts, site risks and management activities.

The Queensland Government will introduce amendments into the Queensland Parliament to enhance the AMLP and give effect to this policy.

These principles will also guide the Queensland Government's approach to managing abandoned operating plant under the *Petroleum and Gas (Production and Safety) Act 2004*.

Appendix 2 Abandoned Mines Consequence and Likelihood Summary Tables

Table 1 Abandoned mines consequence criteria summary table

Consequence	Attribute	1 Negligible	2 Minor	3 Moderate	4 Major	5 Significant
Public Health and Safety	Injury or Illness	Superficial injury with no ongoing physical impairment First aid treatment	Injury requiring medical treatment but no ongoing impairment Medical treatment	Recoverable injury requiring hospital treatment to an individual	Single fatality Single permanent illness, injury or permanent disability Recoverable injury or illness requiring hospital treatment to multiple individuals	Multiple fatalities (>1) Multiple permanent illnesses, injuries or permanent disability Multiple fatalities caused by loss of containment (structural) impacting on downstream population.
Environment	Environmental impact (Impacts to air quality, surface water, groundwater, land)	Reversible impact confined to a small area within the site and minimal impacts to local ecosystems, wildlife and stock.	Reversible impacts confined within the site and requiring some short-term clean-up and remediation. Minimal impacts to local ecosystems, wildlife and stock.	Reversible local impact requiring active restoration / remediation for up to 3 years NEPM's/Anzecc Water Quality Guidelines slightly/occasionally exceeded offsite in localized surface/ground water, air or land Reversible and limited Impacts to ecosystems/or significant species of environmental value. Reversible impact to stock.	Reversible regional impact or requiring active management to restore / remediate for up to 10 years NEPM's/Anzecc Water Quality Guidelines regularly exceeded offsite in surface/ground water, air or land at a broad scale and/or in proximity to close sensitive receptors. Reversible but significant Impacts to ecosystems/or significant species of high environmental value. Irreversible impact to stock.	Irreversible or regional impact requiring significant resources to actively manage restoration /remediation for more than 10 years. NEPM's/Anzecc Water Quality Guidelines permanently and extensively exceeded offsite surface/ground water, air or land at a broad scale and/or in close proximity to sensitive receptors. Permanent and extensive impacts to ecosystems/or significant species of very high environmental value
Social	Public Amenity (Impact on recreation and other productive land uses and tourism)	One-off impact or interruption of access to local amenity	Short-term (< 1 year) impact or interruption of access to local amenity	Medium-term (1-3 years) impact or interruption of access to local amenity. Direct impacts are felt by an individual, or family.	Medium-term (3-10 years) impact or interruption of access to local amenity, & other productive land use. Attractiveness as a place to live is negatively changed. Direct impacts are felt by multiple community members.	Long-term (>10 years) impact or interruption of access to local amenity, or other productive land uses. Impacts are broadly felt by communities with perception that the area has experienced major damage and has become a place to be avoided.
	Impacts to sites of Cultural Heritage (indigenous and non-indigenous)	No impact on local heritage values	Small reduction of local heritage value	Substantial reduction in local heritage value.	Substantial reduction in regional heritage value	Irreversible loss of heritage value of national significance, removal of Indigenous or non-Indigenous sites

Property	Property (Impacts to private or public infrastructure or property)	Loss of revenue or cost to repair or replace infrastructure < \$5K Negligible impact to property	Loss of revenue or cost to repair or replace infrastructure \$5K - \$50K Minor impact to property	Loss of revenue or cost to repair or replace infrastructure > \$50k - \$500K Moderate impact to property	Loss of revenue or cost to repair or replace infrastructure > \$500k - \$5M Significant impact to property	Loss of revenue or cost to repair or replace infrastructure > \$5M Severe impact to property
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Table 2 Abandoned mines likelihood criteria

Likelihood	Description
Almost Certain	Is expected to occur either imminently or within a short period of time Expected to occur > 90% of the time (within a year) Consistently occurs in similar projects
Likely	Will probably occur in most circumstances Expected to occur 66% to 90% of the time (within 2- 5 years) Regularly occurs in similar projects
Possible	Reasonable possibility that it will occur at some time Expected to occur 36% to 65% of the time (within 10 years) Has occasionally happened in similar projects
Unlikely	Plausible but improbable that it will occur Expected to occur 5 to 35% of the time (within 25 years) Not expected, but has been known to happen infrequently in similar projects.
Rare	Plausible but highly improbable that it will occur Expected to occur less than < 5% of the time (within 100 years) Never heard of this occurring or only under exceptional circumstances for similar projects

Table 3 Abandoned mines 5 by 5 risk matrix

		CONSEQUENCE				
		NEGLIGIBLE	MINOR	MODERATE	MAJOR	SIGNIFICANT
		1	2	3	4	5
LIKELIHOOD	ALMOST CERTAIN	5 Medium 5	Medium 10	High 15	Extreme 20	Extreme 25
	LIKELY	Low 4	Medium 8	High 12	High 16	Extreme 20
	POSSIBLE	Low 3	Medium 6	Medium 9	High 12	High 15
	UNLIKELY	Low 2	Low 4	Medium 6	Medium 8	High 10
	RARE	Low 1	Low 2	Low 3	Medium 4	Medium 5

Appendix 3 Glossary

abandoned mine	<p>A site:</p> <p>(a) where mining or mining exploration activities have been carried out</p> <p>(b) for which no current mining lease or mining claim is granted</p> <p>(c) for which no environmental authority is in force for activities mentioned in paragraph (a) that were carried out under a mining lease or mining claim that is no longer in force.</p> <p>The term 'abandoned mine' is used to collectively refer to legacy mines, pre-commencement terminated mines and historical mining disturbances. The term 'abandoned mine' is used to collectively refer to derelict or orphan mine or mine feature for which the responsibility for mine closure cannot be allocated to an individual or organisation.</p>
AMLP	Abandoned Mine Land Program
consequence	Outcome of an event
control	Measure that maintains or modifies risk
decommissioning	Removal, disposal or remediation of redundant mine facilities
environmental authority	An environmental authority issued by the administering authority under Chapter 5 of the <i>Environmental Protection Act 1994</i> .
feature	Unique components that make up a mine, that have a defined function or purpose such as a mining landform or infrastructure. Examples include tailings dam, mineralised materials (waste dumps, ore dumps), mine pits, processing equipment.
financial provisioning scheme (FPS)	The Mineral and Energy Resources (Financial Provisioning) Act 2018 came into force on 1 April 2019. The Act replaces the prior financial assurance arrangements for resource activities under the <i>Environmental Protection Act 1994</i> with the Financial Provisioning Scheme.
hazard	A hazard is a source or a situation with a potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, reputation, financial or a combination of these.
historical mining disturbance	An abandoned mine that ceased production prior to the <i>Environmental Protection Act 1994</i> amendments in 2000, and that does not have features in common with a contemporary mine, typically created by non-mechanised mining methods.
legacy mine	An abandoned mine that ceased production prior to the passing of the <i>Environmental Protection and Other legislation Amendment Act 2000 (EPOLA 2000)</i> , that has features in common with a contemporary mine, typically created by mechanised mining methods. Mines relinquished or abandoned prior to the <i>EPOLA 2000</i> (in effect 1 January 2001) often had limited remediation requirements.
likelihood	The chance or probability of something happening
post-commencement terminated mine	A mine terminated or abandoned after the commencement of the <i>Mineral Resources (Financial Provisioning Scheme) Act 2018</i> (in effect 1 April 2019) where rehabilitation works are funded through the FPS.
pre-commencement terminated mine	An abandoned mine that ceased production after the <i>Environmental Protection Act 1994</i> amendments in 2000 but before the commencement of the Financial Provisioning Scheme.
priority program site	The complex legacy and pre-commencement terminated mines assessed as having high and extreme risks through the AMLP Risk Management Process.
program site	A complex legacy or pre-commencement terminated mine assessed as requiring monitoring, management or remediation activities.
rehabilitation	Re-instating of disturbed land associated with a mine or mine feature to be safe, stable, non-polluting and consistent with the agreed post mining land use. The land is generally returned to a sustainable condition in which ecosystem function is reinstated or to the pre-mining land use. Requirements as described in the Environmental Protection Regulation 2019 – Rehabilitation works to establish a landform – That is safe, stable and self sustaining; and

	With vegetation of a species and density of cover similar to surrounding undisturbed areas or the landform that existed before the mining activity.
relinquished	A mine or feature for which management and monitoring has been completed and tenure has been surrendered, with responsibility transferred to the relevant regulating authority or third party.
remediation	Reduction of human and environmental exposure to hazardous contaminants to acceptable levels. Reduction of the hazards on disturbed land associated with a mine or feature to be safe, stable, secure and productive.
re-purpose	Reclamation of a mine or feature disturbed by mining to a productive condition with a post mining land use alternative to the pre-mining land use.
risk	Impacts associated with features and mine materials that require treatment/remediation The effect of uncertainty on objectives. An effect is a deviation from the expected- positive and/or negative. Objectives can have different aspects (such as financial, health & safety, and environmental goals) and can apply at different levels (such as strategic, organisation-wide, project, product, and process). Risk is often characterised by reference to potential events and consequences, or a combination of these. Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence. Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of an event, its consequence, or likelihood.
risk assessment	The overall process of risk identification, risk analysis and risk evaluation.
risk criteria	Terms of reference by which the significance of risk is evaluated. Risk criteria are based on organizational objectives, external and internal context. Risk criteria can be derived from standards, laws, policies, and other requirements.
risk management	Coordinated activities to direct and control a program with regards to risk.
risk management framework	Set of components that specifies the approach, the management components, and resources to be applied to satisfy the requirements of the Abandoned Mines Risk Management Framework.
risk rating	When assessing risks, the likelihood and consequence of a risk occurring are used to determine the risk rating, which is usually ascertained using a risk rating matrix.
risk register	A record of information about identified risks that defines a risk profile
risk treatment	A process to modify risk including mine remediation or repurposing
shaft remediation	The process of making safe a vertical underground mine working by way of capping, backfilling or plugging the void at the surface.
surveillance program site	The complex legacy and pre-commencement terminated mines assessed as not having high or extreme risks to be managed and those sites where high risks have been formally accepted and signed off that no additional risk treatment is warranted.
tailings storage facility	A dam, impoundment or structure designed and constructed to contain and store tailings.
tailings	Residual material that has been crushed and ground and/or washed and rejected from a mill or processing plant after the ore minerals have been extracted.
waste rock dump	Stockpile of waste rock

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