

A framework for developing
mine-site completion
criteria in Western Australia

CHAPTER

1

Introduction

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1 Introduction

1.1 Completion criteria

Mining is a temporary land use and whole-of-life planning for resource projects that enables the delivery of mutually beneficial post-mining land uses is important to the future progress of the sector (Commonwealth of Australia 2018). The development of acceptable and achievable completion criteria is a necessary part of mine closure planning and fundamental to the successful transition of mined land to a future use. Completion criteria have been defined in the mining context as **agreed standards or levels of performance that indicate the success of rehabilitation and enable an operator to determine when its liability for an area will cease** (LPSPD 2016b).

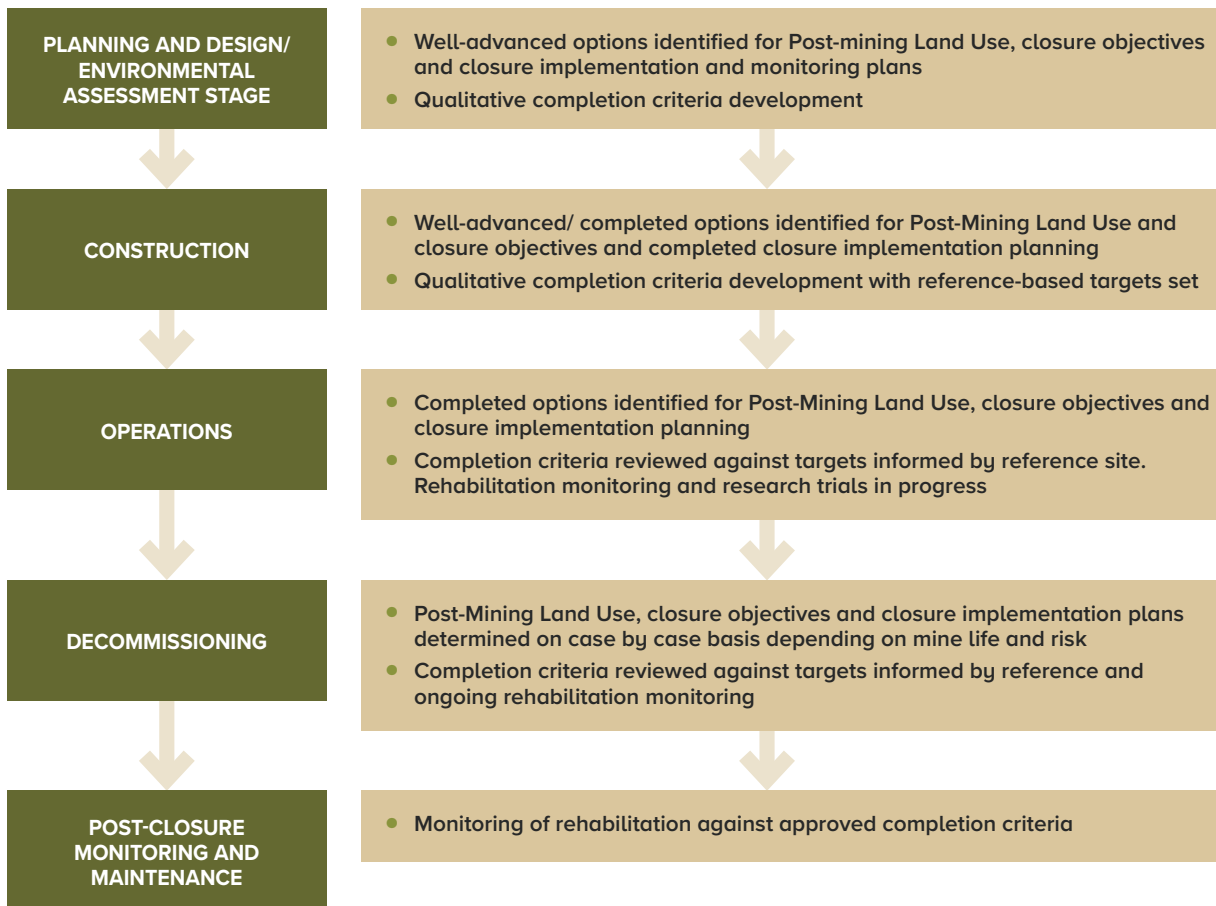
Once achieved, completion criteria demonstrate to the mining company, regulators and other stakeholders that financial assurances and liabilities can be removed. Relinquishment from obligations (where it is legally possible to do so, noting some obligations are not relinquishable – e.g. the Contaminated Sites Act 2003) can ultimately occur if the area is in a state where risks of deleterious environmental, health and safety impacts are at an acceptable level, and the agreed future land use can commence. This is recognised in the Western Australian *Guidelines for Preparing Mine Closure Plans* (DMP & EPA 2015) that state:

“Relinquishment of a tenement requires formal acceptance from the relevant regulators that all obligations under the Mine Closure Plan associated with the tenement, including achievement of completion criteria, have been met and, where required, arrangements for future management and maintenance of the tenement have been agreed to by the subsequent owners or land managers (e.g. pastoralist, Aboriginal community or land-management agency).”

While considerable progress has been made in mine closure and rehabilitation planning in Western Australia (WA) (Environment and Communications References Committee 2018), there remains a need to build capacity and understanding of how to best measure rehabilitation success and to set practical outcomes and measurable completion criteria.

Planning for mine closure should occur across the life of mine phases. As a key aspect of the mine closure planning process, the development of completion criteria should be considered from approval stage with activity continuing post closure (Figure 1.1).

Throughout the life of mine there are opportunities for continual refinement to ensure completion criteria are robust and will best demonstrate that closure objectives have been met. Monitoring and the associated use of completion criteria provides a mechanism for adaptive management and refined risk assessments. This is particularly important as continual improvement in rehabilitation techniques will occur over time and proponents should actively include this in their mine closure planning (DMP & EPA, 2015).



Source: Modified from DMP & EPA (2015) Mine Closure Guidelines

FIGURE 1.1 The stages of mining and associated development of completion criteria as defined by the Western Australian mine closure planning process

1.2 Project scope and purpose

The project 'Framework for developing risk-based completion criteria in Western Australia' was carried out to support the prioritisation of data collection and monitoring activity to enable the development and assessment of completion criteria. Consultation with regulators and industry in Western Australia (WA) has suggested this is a key gap in enabling more effective mine closure. The current report is an independent document that has been developed by the Western Australian Biodiversity Science Institute (WABSI) with two key aims:

- Review the rehabilitation completion criteria and monitoring knowledge base, and
- Develop a science-based framework for post-mining rehabilitation completion criteria and monitoring.

The report has been developed by leading experts in partnership with representatives from key mining industry and regulatory agencies in Western Australia. The development of the report has been strongly informed by the requirements of the resource sector in order to provide information and a decision support framework that best meets the requirements of:

- Mining companies and service providers operating across all geographic regions in Western Australia;
- Regulatory and policy making agencies of government;
- Public and private research institutions supporting continual improvement.

The report has been designed to extend information provided in best practice guides, such as the Leading Practice Sustainable Development Program (LPSPD) for the *Mining Industry – Mine Closure* handbook (LPSPD 2016d). The intent of the report is to support the development and implementation of completion criteria and associated monitoring programs as outlined in the *Guidelines for Preparing Mine Closure Plans* (DMP & EPA 2015). The guidelines have been developed by the Western Australian Department of Mines and Petroleum (DMP, now Department of Mines, Industry, Regulation and Safety (DMIRS)) and the Environmental Protection Authority (EPA) to meet the respective objectives of the Western Australian regulatory requirements:

“The Department of Mines and Petroleum’s (DMP) principle closure objectives are for rehabilitated mines to be (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.”

“The Environmental Protection Authority’s (EPA) objective for Rehabilitation and Decommissioning is to ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner.”

The Department of Mines, Industry Regulation and Safety (DMIRS) and the EPA require the following information to be included in a Mine Closure Plan:

- Completion criteria that will be used to measure rehabilitation success;
- Completion criteria that will demonstrate the closure objectives have been met; and
- Completion criteria developed for each domain which consider environmental values.

Mine Closure Plans are regularly reviewed over the life of a mine, with updates on the further refinement and development of completion criteria. This provides direction for the monitoring of information required to develop robust criteria and considering trajectory of rehabilitation management actions.

1.2.1 Limitations in scope

Being the first project of its kind and to be completed in a relatively short timeframe, the scope of the project gave priority to guidance in the development of biological completion criteria. Addressing the broader range of completion criteria to a high level of detail was not possible with the time and resources available. The report should be read in conjunction with other materials released by DMIRS and Department of Water and Environmental Regulation (DWER). The process of relinquishment and challenges faced by industry are also not addressed in this document. At the time of publication, additional projects and documents are in development to address some of these knowledge gaps. Updated versions of the report may be warranted in future years to incorporate additional detail towards the non-biological aspects of the framework, relinquishment process and other identified gaps as outlined in Section 6.1.

1.3 How to use the document

This report and the associated framework have been developed with the resource sector as the target audience. However, it is recognised that completion criteria development and monitoring are relevant within other rehabilitation or ecological restoration contexts. The EPA’s interest in completion criteria, for example, extends beyond mining projects to other developments such as infrastructure programs that require similar rehabilitation of disturbed lands. While mining is the primary industry identified to use this document, this report and associated framework have been designed to be inclusive of the diverse range of potential activities that may make use of completion criteria guidelines. When using this document to support completion criteria development in different sectors or jurisdictions across Australia and internationally, it is important that users pay close attention to relevant legislation and existing guidance information within their specific context.

The framework presented is intended to be used as a supporting guide to develop completion criteria for mine closure in Western Australia. The procedure proposed is not intended to be a replacement if existing processes are well established and have proven to be successful. The outlined steps to developing completion criteria may be used in their entirety or as individual components to strengthen current practices. The individual processes undertaken by industry to develop site completion criteria should be well documented and available for discussion with regulators and key stakeholders as part of ongoing consultation as a mine progresses towards closure.

This report has two parts. The first part (Chapter 2) presents a new framework to help guide the decision-making process associated with completion criteria development. The second part (Chapters 3, 4 and 5) document current understanding and perspectives on completion criteria development.

The first part presents a decision framework for developing and assessing completion criteria (Chapter 2). The framework is presented as a process consisting of six steps that enable the successful achievement of a post-mining land use. However, the framework is relevant across the life of mine and should be used in an iterative manner, with consideration of completion criteria being initiated during the exploration or approval stage, iterative development, monitoring and refinement of completion criteria across the operational stage and finalisation and assessment of completion criteria as part of the relinquishment and successful transition to next land use. The framework may also be applied spatially, recognising potential variations in closure objectives and completion criteria across a site. Notably, different domains or areas within one single mine site may be capable of achieving different levels of rehabilitation and, thus, will require distinct completion criteria and rehabilitation works. It is also possible that different domains within a single mine could have different post-mining land uses.

Each step in the framework includes key considerations and guidance to inform the decision making and prioritisation process. The decision-making process should be captured when using the framework to develop site-specific criteria. Tools have been provided to support the recording and presentation of information to demonstrate the process used and application to a particular site or domain. A common set of definitions, processes and methods will also help to reduce inconsistencies across regulators, mining companies and consultants in developing completion criteria. For the wider community and environment, a better process for the definition of mine completion criteria will assist in a greater number of mines being completed and, ultimately, relinquished.

The second part of the report includes foundational information that captures the current state of knowledge on completion criteria development. Collectively, the second part provides an important context and directions for users of this guide to consider and learn from when developing completion criteria and risk-based monitoring system development in Western Australia.

Chapter 3 consists of a review of existing guidelines, frameworks and principles for the establishment of completion criteria and associated risk assessment that are available in Western Australia, as well as national or international frameworks applicable to Western Australia. The review presents an assessment of the attributes that may be developed into completion criteria and associated monitoring and evaluation approaches. This provides a valuable reference for informing the development of completion criteria.

The second part also presents the views of stakeholders provided through interviews and surveys within the resource sector (Chapter 4). This provides insights into current understanding and consideration of post-mine land use decisions, completion criteria, risk assessment and monitoring practices, and the process of mine closure planning in Western Australia. The interviews and surveys also highlight the key challenges regulators, mining companies and consulting sector face in the identification and evaluation of completion criteria.

The case studies (Chapter 5) detail the key challenges and decision-making processes at three sites that represent varied environment, mining, and social contexts: Goldsworthy Northern Area (iron ore, BHP Billiton), Talling Peak (iron ore, Mount Gibson Iron) and Northern Jarrah Forest (bauxite, Alcoa of Australia).

1.4 Terminology and definitions

In this document, the term 'rehabilitation' is defined as 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, and is consistent with the agreed post-mining land use (DMP & EPA 2015). This description fits the general practice of design and construction of landforms and soil profiles together with revegetation as described in the LPSDP handbook (LPSDP 2016e), that is typical of almost all Australian mine sites, and is distinct from 'ecological restoration' (definition in Table 1.1).

A feature of any discussion of completion criteria for mine rehabilitation is the differences in terminology used to describe various elements of a completion criteria framework, or differences in meaning for the same terminology. Predictably, these differences in terminology can be found between different countries and jurisdictions, but also exist between mining operations, and their stakeholders within Western Australia. For this review, we have drawn on language from guidance published by Western Australia (DMP 2016), Queensland (DEHP 2014) and New South Wales (NSW) (TIRE 2013), the Australian LPSDP series (LPSDP 2016d,e) and the National Standards for the Practice of Ecological restoration Australiasia (SERA 2017).

TABLE 1.1 Definitions of key terminology

Term	Definition	Source(s)
Aspect	A key theme or element of rehabilitation that needs to be addressed in order to meet the mine site’s closure objectives. Also known as ‘Environmental factor’.	Adapted from DMP & EPA 2015
Attribute	A specific parameter that can be quantified, or task that can be verified to have been achieved. Forms the basis for a criterion. Also known as ‘Indicator’ or ‘Performance indicator’.	Adapted from DMP & EPA 2015; McDonald <i>et al.</i> 2016
Auditing	The process whereby the site’s level of rehabilitation performance – as reflected in the monitoring data - is compared with the standards agreed in the completion criteria.	
Closure	A whole-of-mine-life process, which typically culminates in tenement relinquishment. It includes decommissioning and rehabilitation.	DMP & EPA 2015
Closure objectives	Required outcomes, for each aspect, that will allow 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 and is consistent with the agreed post-mining land use. Closure objectives should be i) realistic and achievable; ii) developed based on the proposed post-mining land use(s); and iii) as specific as possible to provide a clear indication on what the proponent commits to achieve at closure. They may include, but should not be limited to, compliance, landforms, revegetation, fauna, water, infrastructure and waste.	
Completion	The goal of mine closure. A completed mine has reached a state where mining lease ownership can be relinquished and responsibility accepted by the next land user.	DMP & EPA 2015
Completion criteria	Agreed standards or levels of performance that indicate the success of rehabilitation and enable an operator to determine when its liability for an area is able to cease. A <i>criterion</i> is a condition to be achieved for a particular attribute that is critical in achieving the objective. Where possible, criteria should be quantitative and/or capable of objective verification. Also known as ‘completion, closure, success or performance criteria’, ‘indicator’, ‘standard’ or ‘target’. Sometimes presented as separate indicator (what to measure) and standard (the level to be achieved).	
Data monitoring	The collection and interpretation of information that is necessary to assess the progress towards meeting completion criteria.	
Ecological restoration	The process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed.	SERA 2017
Monitoring	The observation and checking of the progress or quality of performance over a period of time.	
Objective	See closure objective.	
Post-mining land use (PMLU)	Term used to describe a land use that occurs after the cessation of mining operations.	DMP & EPA 2015
Reference	A suite of conditions that serve to inform the level of performance to be used in the definition of completion criteria. References should provide indication on measurable targets for those attributes that will define completion criteria. For each mine site, one or more references can be used.	

Table 1.1 continues following page...

TABLE 1.1 Definitions of key terminology

Term	Definition	Source(s)
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-mine land use.	DMP & EPA 2015
Relinquishment	A state when agreed completion criteria have been met, government “sign-off” achieved, all obligations under the <i>Mining Act 1978</i> removed and the proponent has been released from all forms of security, and responsibility has been accepted by the next land user or manager.	DMP & EPA 2015
Corrective action	Changes made to a nonconforming site to address the deficiency. May also be referred to as ‘remedial action’ or ‘active management’.	ANZMEC & MCA 2000
Revegetation	Establishment of self-sustaining vegetation cover after earthworks have been completed, consistent with the post-mining land use.	DMP & EPA 2015
Verification	The method used to confirm that the identified standard for the criterion has been achieved. Verification may rely on quantitative measurements or could be a process of certification, for example in terms of compliance with an approved design.	

(END OF CHAPTER 1)

