



MT CARBINE BANKABLE FEASIBILITY STUDY

CHAPTER 9: CLOSURE AND REHABILITATION

DECEMBER 2021



Document History

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1. Introduction

1.1. Context

This Chapter 9: Closure and Rehabilitation shall be read in conjunction with Chapter 1: Executive Summary and additional references as listed in Section 3.

1.2. Purpose

The purpose of Chapter 9: Closure and Rehabilitation is to outline the rehabilitation and closure requirements as related to the Mt Carbine mine and the Project.

1.3. Rehabilitation Background

As an operating mine and quarry, EQR has a current financial assurance bond and estimated rehabilitation cost (ERC) in place with to the value of \$1,048,885.

Progressive rehabilitation has already commenced on the site and will continue during the operations. A key rehabilitation benefit of the Mt Carbine operations is the quarry business's ability to utilise mine waste material as saleable quarry product, significantly reducing the rehabilitation requirements as nearly all mine waste is planned to be sold as quarry product.

Part of the feasibility study scope includes upgrades to the gravity processing plant tailings treatment that separates the tailings into a free draining sand and a -250µm ultra-fine material, both of which are saleable as quarry products, in addition to the unprocessed coarse rock that is identified as barren in the crushing, screening and sorting process.

At the completion of operations when the resource reaches end of life, the quarry will be left with a stockpile of saleable product that will allow ongoing cash generation while the rehabilitation on the site is completed.

2. Closure and Rehabilitation

Opinions in this section relate solely and exclusively to environmental management matters and are based on the technical and practical experience of environmental practitioners. They are not presented as legal advice, nor do they represent decisions from the regulatory agencies charged with the administration of the relevant Acts.

2.1. Overview

The land relevant to the Project site is used for quarry and mining activities as per the respective licences (EA EPPR00438313, dated 16 March 2021 for the quarry and EA EPML00956913, dated 1 December 2020 for the mine). For the Project site, the existence of an EA for the quarry area and a separate EA for the mining area creates complexity.

In common, the successful surrender of the EAs that apply to the land on which quarry and mining activities occur is necessary to terminate the licensee's obligations to the State. The requirements for a surrender application are detailed in Section 262 (and further in Sections 264 and 264A) of the EP Act¹. For both EAs, the Administering Authority determines conformity with the obligations, unless the matter is in dispute—in which case the Court ultimately decides.

A key pre-requisite to surrender is the fulfilment of obligations associated with conditions of the EAs². The acceptable rehabilitation of land disturbed by licensed activities is fundamental to closure for both quarry and mine areas³. For the EA relevant to the mining activities, associated residual risk⁴ requirements are also key. Reforms to the regulatory system regarding rehabilitation that came into effect on 1 November 2019 require that mining projects have a Progressive Rehabilitation and Closure Plan (PRCP) and PRCP schedule⁵. All resource projects in Queensland will need to comply with the new regulatory system before 1 November 2022⁶; at this time the EA holder has not been invited by the Administering Authority to initiate the process. Another reform is the creation of the role of Rehabilitation Commissioner under the EP Act with the first appointee commencing in October 2021⁷.

¹ The surrender application requirement varies for resource activities in comparison to other activities. Briefly:

- if the EA contains conditions about rehabilitation, and a Progressive Rehabilitation and Closure Plan (PRCP) schedule does not apply for the relevant activity, a final rehabilitation report for the EA that complies with Section 264 must be submitted
- if the EA is for a resource activity, whether or not a PRCP schedule applies for the activity, a post-surrender management report for land the subject of the application that complies with Section 264A must be submitted.

Another variation between resource and other activities is the requirement, in the case of resource activities, to report any consultation with affected owners and occupiers, members of the public, community groups, government agencies, and other bodies about any completion criteria for rehabilitation stated in the EA (EP Act current as at 9 September 2021, accessed 12 October 2021).

² Relevant obligations may exist in Compensation Agreement(s) made between the mining title(s) holder and the landholder(s); the surrender of mining titles, and the associated mining title surrender process and obligations, is also relevant.

³ *The Queensland Government is committed to ensuring land disturbed by mining activities is rehabilitated to a safe and stable landform that does not cause environmental harm and is able to sustain an approved post-mining land use* (Mined Land Rehabilitation Policy, Queensland Government (current as at 12 October 2021)).

⁴ Under the EP Act, residual risks are considered as part of the surrender application for an EA for a resource activity (*Residual Risk Assessment Guideline – Interim*. ESR/2020/5433 Version 1.00 effective 2 October 2020).

⁵ The PRCP schedule is akin to an EA given the tasks and milestones that are mandatory once approved; it cannot be altered without an amendment process, and it cannot be surrendered without adhering to a regulatory process.

⁶ Before the transition period lapses, the Administering Authority will invite the EA holder to prepare and submit a PRCP and PRCP schedule.

⁷ The Government reports: *The Queensland Rehabilitation Commissioner for mining, petroleum and gas (resource) activities is an independent, statutory position, developing technical and evidence-based information on complex mine rehabilitation matters. The Rehabilitation Commissioner's role is to define best practice rehabilitation of land, helping to ensure Progressive Rehabilitation and Closure Plans (PRCPs) are world class, and to facilitate better public reporting about rehabilitation in Queensland* (<https://www.qld.gov.au/environment/land/management/rehab-commissioner> (accessed 12 October 2021)).

2.2. Approach

The closure strategy encompasses a staged approach to rationalising land and water management, environmental monitoring and compliance⁸.

- Stage 1 includes a review of existing site conditions and the EAs; identifying necessary modifications as relevant and developing a plan to affect change.
- Stage 2 is the development of an optimisation plan for the land and water management and monitoring across the Project site.
- Stage 3 involves updating supporting regulatory and management documentation and implementation.

Although a source of licensing complexity, the co-existence of the quarry and mining activities results in the beneficial re-use of tailings and low-grade ore stockpiles located on the site that are remnant from previous operations on the site; as well as the use of non-mineralised material⁹ and reuse of process residues associated with the renewed open pit mining. This is a significant outcome for rehabilitation and closure considerations *ie* the solid wastes (process residue and waste rock materials) associated with mining are inventory for the quarry.

The alignment of the conditions of the quarry and mining EAs is equally sought by the Administering Authority and is intended as one of the outcomes of the EA amendment process. Similarly, the PRCP and PRCP schedule will need to be developed and align with conditions of the relevant EA. The PRCP provides the opportunity to clarify rehabilitation objectives and specifications, and although the PRCP process is not a regulatory requirement for the quarry, it is intended to clarify rehabilitation objectives and specifications irrespective of activity.

The strategy presents a simple approach to a complex risk. The overarching intent is for all environmental monitoring and compliance programs, together with all associated reporting prepared under the auspices of the EAs, PRCP and PRCP schedule as relevant, to serve not only the purpose of compliance but to ultimately provide evidence for successful closure and final relinquishment.

2.3. Risk

The Risk Assessment for the Project is presented in Chapter 14: Risk and Opportunity. From a closure perspective, failure to achieve the intended outcome, expressed as being the successful surrender of the EAs that apply to the land on which quarry and mining activities occur, is the risk. The reason for failure may be technical or regulatory and are not necessarily independent. Technical reasons for failure broadly concern environmental values such as land and water¹⁰; whereas the regulatory reasons pertain to, for example, licence conditions and overarching legislation.

Key technical risks include land condition and water quality and may be described as unacceptable end land use and failure to maintain existing water *ie* surface water and groundwater uses. The factors that contribute to these outcomes include contamination and failure of land rehabilitation. With respect to contamination (land and water) the primary concern is problematic mined materials that contribute elevated levels of pollutants, to either land or water, that render the land or water unacceptable for the intended use.

⁸ Performance requirements that are not specified will need specification, which is necessary for (among other things) monitoring and assessment.

⁹ The EA EPPR00438313, dated 16 March 2021, for the quarry includes the following definition: 'Ore or waste rock characterised as having acid forming potential' means any rock with either a Net Acid Producing Potential of greater than 5 kg of H₂SO₄/tonne or a Net Acid Generation oxidation pH of less than 4.5 (pH unit).

¹⁰ During operations, values in addition to land and water are key technical risks *eg* air quality, acoustic quality.

Water (surface water, groundwater and wetlands)

The Project area is within the Manganese Creek and Holmes Creek catchments, which drain to the Mitchell River approximately 5 km downstream. Manganese Creek and Holmes Creek are intermittent watercourses that are dry for most of the year.

Environmental values (EVs) are not nominated under the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* for the part of the Mitchell River basin relevant to the Project's receiving environment.

The surrounding land use is rural-urban, low intensity grazing, mining and exploration, and conservation (*ie* Brooklyn Nature Refuge). It is understood that the section of Mitchell River near Mt Carbine is used for swimming and other recreational activities though raw water is not drawn directly from the site's receiving water for drinking water.

Based on the review of the receiving surface water quality of the Project site, and reflecting the previous human activities of the area (*ie* grazing, quarrying and mining), the receiving environment is expected to comprise *moderately disturbed waters*, as defined in the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*.

Considering the above information, the nominated EVs for the receiving surface water of the Project site include the following.

- Aquatic ecosystems—moderately disturbed systems;
- Human use:
 - primary industries—livestock drinking water;
 - cultural and spiritual values;
 - recreation and aesthetics; and
 - industrial use.

There are no wetlands of national or international significance mapped in the Project site or the receiving environment (DES 2021a). There are no High Ecological Value Waters (watercourses), High Ecological Value Waters (wetlands) or Wetlands of High Ecological Significance mapped in the Project site or the receiving environment (DES 2021b).

Surface water, sediment and aquatic macroinvertebrates were monitored during the 2020–2021 monitoring period (1 July 2020 – 30 June 2021) for the Mt Carbine Tungsten Project Receiving Environment Monitoring Program (REMP). Samples were collected from sites in the Holmes Creek and Manganese Creek catchments. Results collected as part of the REMP, and assessed as part of the annual REMP report, indicated no discernible impact on the aquatic ecosystem and human use EVs associated with the contemporary mining activities (NRA 2021).

Groundwater Dependent Ecosystems (GDEs) that have 'a high potential for groundwater interaction – reliant on surface expression of groundwater' (*ie* aquatic GDEs) are mapped for a section of Manganese Creek downstream of the Mt Carbine township (BoM 2021). GDEs that have 'a high potential for groundwater interaction – reliant on subsurface presence of groundwater' (*ie* terrestrial GDEs) are mapped to occur in the southern extent of the Project site, and 'low potential' terrestrial GDEs are mapped to occur in the northern half of the Project site (BoM 2021). Groundwater uses for the Mt Carbine mining Project have been identified as stock watering and firefighting (NRA 2013).

The groundwater modelling work reported in NRA (2013) identified that the Mt Carbine pit was expected to behave as a groundwater sink. Since this work was completed, water management practices have altered; water levels have increased in the pit and the effects on hydrogeology require re-evaluation. Additional studies to be conducted as part of the mining EA amendment process are intended to inform the assessment of groundwater quality exceedances, for which there is a lack of an apparent link between the exceedances and changes to mine related activities on-site. In this regard:

- Stage 1 of the Mt Carbine Groundwater Study has been undertaken by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE 2020);

- GHD (2021) has undertaken a water chemistry review; and
- Rob Lait & Associates and Oasis Hydrogeology Pty Ltd have been engaged to continue hydrogeological investigations.

The intent is to develop an improved groundwater quality monitoring and assessment approach based on the groundwater studies and present this to the Administering Authority for consideration for use in the mining EA.

Land

The Project site is on land disturbed by mining activities (historical and contemporary). The land characteristics for the Project area are summarised as follows:

- The topography ranges from level alluvial plains to high hilly and mountainous lands with very steep slopes;
- Soils are either shallow bleached loams or hard pedal mottled-yellow duplex soils;
- The Project is within the Mitchell River catchment with two ephemeral watercourses receiving runoff from the site, *ie* Manganese Creek to the east and Holmes Creek to the west;
- Land use on the Project area is licensed for mining and quarrying. The immediate surrounding land use is conservation (Brooklyn Nature Refuge), with low intensity beef cattle grazing, mining and exploration, and residential in the township of Mt Carbine; and
- Land suitability (based on pre-disturbed areas) is considered to be Class 4 on flatter areas, and Class 5 on steeper areas.

Matters of State Environmental Significance (MSES) are mapped for the Project area (DES 2021b). The mapping is not consistent with on-ground conditions, *ie* the regulated vegetation associated with a watercourse (MSES 8e) does not exist on account of the presence of historical mining waste rock and tailings stockpiles.

Outside of the Project area, the land is mapped as a Protected Area – nature refuge (MSES 1b) due to the Brooklyn Nature Refuge. The non-disturbed land in the Project area (*ie* the land area with remnant vegetation) is mapped to contain threatened (Endangered or Vulnerable) wildlife values (MSES 7a), Special Least Concern animals (MSES 7b) and essential habitat (MSES 8d). The mine and quarry activities occur on disturbed lands. The following species, listed as Endangered, Vulnerable or Special Least Concern under the *Nature Conservation Act 1992*, have historical records within and/or adjacent to the Project area, and are identified in DoR (2021) and/or DES (2021b).

- *Turnix olivii* (Buff-breasted Button-Quail, Vulnerable);
- *Rostratula australis* (Australian Painted Snipe, Endangered);
- *Calidris ferruginea* (Curlew Sandpiper, Endangered);
- *Macroderma gigas* (Ghost Bat, Endangered);
- *Grantiella picta* (Painted Honeyeater, Vulnerable);
- *Gallinago hardwickii* (Latham's Snipe, Special Least Concern);
- *Actitis hypoleucos* (Common Sandpiper, Special Least Concern);
- *Calidris acuminata* (Sharp-tailed Sandpiper, Special Least Concern);
- *Calidris ruficollis* (Red-necked Stint, Special Least Concern);
- *Tringa nebularia* (Common Greenshank, Special Least Concern);
- *Pluvialis fulva* (Pacific Golden Plover, Special Least Concern); and
- *Tringa stagnatilis* (Marsh Sandpiper, Special Least Concern).

Neither licence (EA EPPR00438313, dated 16 March 2021 for the quarry and EA EPML00956913, dated 1 December 2020 for the mine) provides the detail that is necessary to quantify all the rehabilitation

specifications. The PRCP provides the opportunity to clarify rehabilitation objectives and specifications, and although the PRCP process is not a regulatory requirement for the quarry, it is intended to clarify rehabilitation objectives and specifications irrespective of activity.

Rehabilitation trials were conducted on waste rock and tailings materials in 1993 (NRA 1994). The trials included seeding and fertilising with two treatments, and found that:

- the lack of stored soil water is a potential limiting factor to plant establishment on the tailings surface; and
- an absence of soil-seed contact was the likely cause of plants' inability to establish on the waste rock dump.

Further rehabilitation trials are planned to be established for the 2020-21 wet season and are intended to address EA conditions and to inform the future PRCP.

2.4. Estimated Costs

The land relevant to the Project site is used for quarry and mining activities as per the respective licences (EA EPPR00438313, dated 16 March 2021 for the quarry and EA EPML00956913, dated 1 December 2020 for the mine). The statutory administrative arrangements, and more specifically the delineation of land areas according to activity (*ie* mining *cf* quarrying) and by extension the rehabilitation requirements, were established to reduce the financial assurance cost¹¹. The *Mineral and Energy Resources (Financial Provisioning) Act* 2018 came into force on 1 April 2019. This Act includes provisions that replaced the financial assurance arrangements for resource activities under the EP Act with the requirement to provide either surety or a percentage contribution to the Financial Provisioning Scheme (based on the ERC for the Project). The Administering Authority has decided the ERC amount for EA EPML00956913 (*ie* the mining activities) to be \$1,048,885.14 for the period 25 June 2021 to 24 June 2022 (DES 2021c)¹².

Table 1: Current Mt Carbine ERC Cost

Relevant EA	ERC Amount (AUD)
EPML00956913	1,048,885

EQR will be required to submit a new ERC to account for the additional rehabilitation requirements from the Phase 1 and Phase 2 mining activities. The default rates from the ERC calculator were applied in accordance with the details in Table 2. The additional ERC costs are forecast to support the first two years of mining at a minimum, after which time EQR plans to transition to the Financial Provisioning Scheme.

Table 2: Additional ERC Costs

ERC Calculator Activity Description	Forecast Additional ERC Amount (AUD)
2. Infrastructure – Pipelines – 1,500m (150-200mm diameter)	19,689
3. Overburden and Waste Rock - Waste Rock Dump – 1Ha	161,317
6. Pits – Open Void Footprint – 21Ha	17,381
Project Overheads and Contingency	49,597
Total	247,984

¹¹ The Administering Authority has the discretion to seek financial assurance in relation to the quarrying activities; to date, it has not exercised this discretion.

¹² Pursuant to section 302 of the EP Act, the holder of an EA for a mining activity must apply, under section 298 of the EP Act, for a new ERC decision at least 3 months before the current ERC period ends. The licence holder is obliged to lodge an application for a new ERC decision for EPML00956913 by 24 March 2022 (DES 2021d).

3. References

- AGE 2020, Mt Carbine Groundwater Knowledge Gap Assessment, prepared for Mt Carbine Pty Ltd by Australasian Groundwater and Environmental Consultants Pty Ltd, 27 May 2020 (Project No G2011) (v01.04).
- BoM 2021, Groundwater Dependent Ecosystems Atlas, Commonwealth Bureau of Meteorology, Canberra, viewed 31 August 2021, <<http://www.bom.gov.au/water/groundwater/gde/map.shtml>>.
- DES 2021a, Wetland Maps, Queensland Department of Environment and Science, Brisbane, viewed 31 August 2021, <<https://wetlandinfo.des.qld.gov.au/wetlandmaps/>>.
- DES 2021b, Matters of State Environmental Significance Environmental Report, Queensland Department of Environment and Science, Brisbane.
- DES 2021c, Decision Notice - Estimated Rehabilitation Cost (ERC) decision, prepared by Department of Environment and Science to Mt Carbine Quarries Pty Ltd, dated 25 June 2021 (ref 101/0008754; EPML00956913).
- DES 2021d, Estimated Rehabilitation Cost (ERC) period expiry, letter from Department of Environment and Science to Mt Carbine Quarries Pty Ltd, dated 24 September 2021 (ref 101/0008754).
- DoR 2021, Regulated Vegetation Management Map Report, Queensland Department of Resources, Brisbane.
- GHD 2021, Mt Carbine Groundwater Study Peer Review – Groundwater Chemistry Review, prepared for Mt Carbine Quarries Pty Ltd by GHD, May 2021 (Final 0).
- NRA 1994, Mt Carbine Report on Revegetation Trials, prepared by Natural Resource Assessments Pty Ltd for Queensland Tungsten, 14 June 1994.
- NRA 2013, Mt Carbine Tungsten Project Stage 1 – Environmental Management Plan, prepared by NRA Environmental Consultants for Carbine Tungsten Ltd, 28 June 2013.
- NRA 2021, Mt Carbine Tungsten Project Annual Receiving Environment Monitoring Program Report 2021, R01, prepared by NRA Environmental Consultants for Mt Carbine Quarries Pty Ltd, 18 August 2021.

4. List of Abbreviations

Abbreviation	Description
DES	Department of Environment and Science
EA	Environmental Authority
ERC	Estimated Rehabilitation Cost
EV	Environmental Value
GDE	Groundwater Dependent Ecosystems
MSES	Matters of State Environmental Significance
PRCP	Progressive Rehabilitation and Closure Plan
REMP	Receiving Environment Monitoring Program

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