



Environmental Approval & Compliance Solutions

Mt Carbine Project Progressive Rehabilitation and Closure Plan

Mt Carbine Quarries Pty Ltd

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Cover Page

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Appendix 2: Revised Conceptual Groundwater Model (RLA & Hydrogeologist 2022)

Appendix 3: Mount Carbine Void Water Quality, Groundwater Relationship and Spill Risk (NRA 2023c)

Appendix 4: Open Cut Pit – Final Void Water Balance Model (ATCW 2022b)

Appendix 5: Risk Assessment Register

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Appendix 7: Spatial Information Relating to the PRCP

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Appendix 9: Correspondence Relating to Land Use and Tenure

Appendix 10: Mount Carbine Void Closure Plan

1. Rehabilitation Planning Part

1.1 Project planning

This section includes baseline information, site location details, a description of the project and information on rehabilitation/improvement planning.

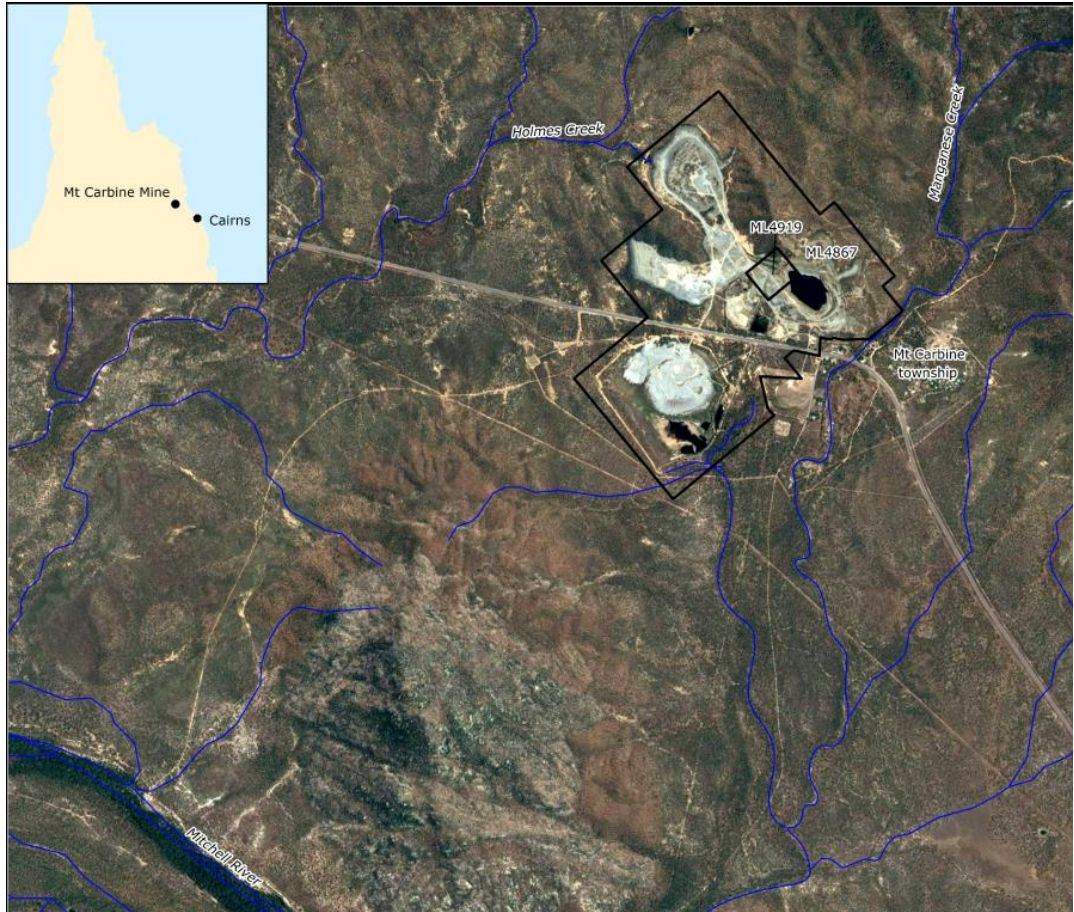
1.1.1 Site location and tenure

The relevant land area 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 19 September 2023 for the mine). The site is approximately 130 km by road from Cairns in the Mareeba Shire, north Queensland (**Plate 1**). The site is on granted mining leases (MLs) 4867 and 4919, each with an area of 358.5 ha and 7.9 ha respectively, on Lot 13 on Plan SP254833.

The surrounding land use is rural-urban (Mount Carbine township), low-intensity cattle grazing, mining and exploration, and conservation (Brooklyn (Station) ¹). The background land tenure (Lot 13 on SP254833) is Brooklyn (Station), which is held by the Australian Wildlife Conservancy as a rolling term lease – pastoral (Title Reference 17664140); a special condition of this lease is to allow quarry material to be removed (QTR 2021). The genesis of these land uses is documented in a letter prepared in response to a query from the administering authority (AA) (**Appendix 9**).

The site is accessed from the Mulligan Highway, which cuts through ML 4867. Photographs of the site (**Plates 2–4**) show existing disturbed land.

¹ As listed in Schedule 5 of the Queensland *Nature Conservation (Protected Areas) Regulation 1994* current as at 30 June 2023.



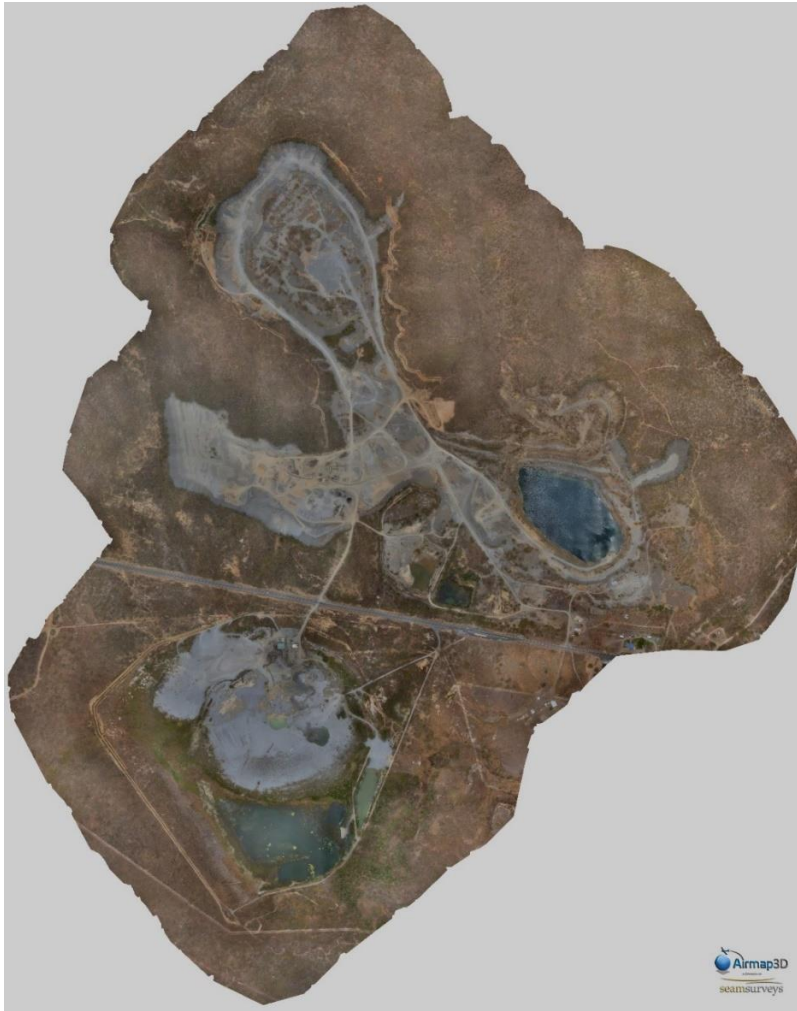
Source: NRA 2022a

Plate 1: Project location



Source: EQ Resources Ltd.

Plate 2: Mt Carbine site overview



Source: Seam Surveys Pty Ltd

Plate 3: Whole of site image (flown 27 October 2020)



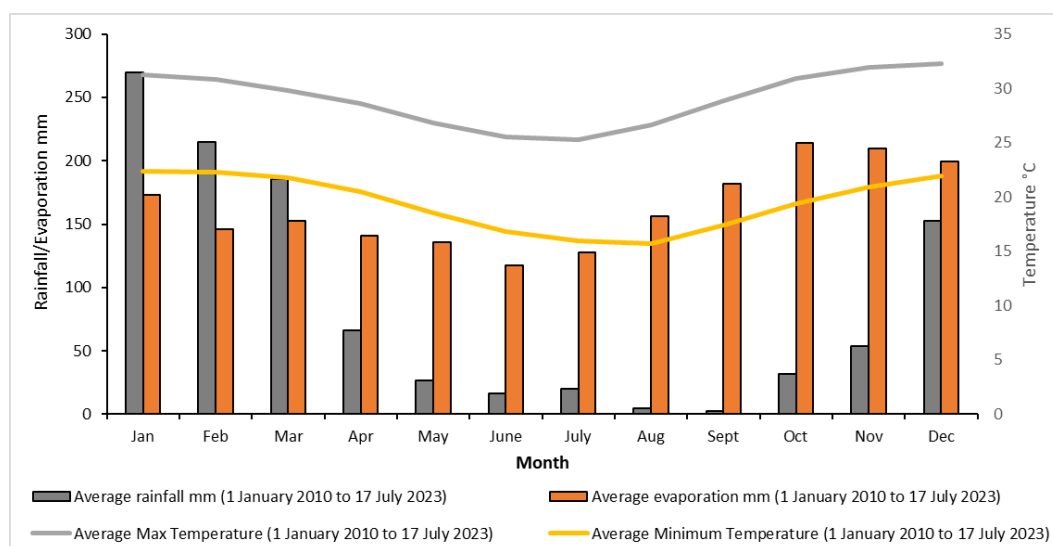
Source: EQ Resources Ltd

Plate 4: Quarry

1.1.2 Baseline information

Climate

Monthly rainfall, evaporation, daily maximum and daily minimum climate data are presented from longpaddock.qld.gov.au (Stone *et al.* 2019) based on data from 2010–2023. Rainfall, evaporation and temperature are in **Graph 1**. Most rain falls between December and March. The average daily maximum temperatures for these months range between 29.8°C and 32.2°C. Drier and cooler conditions occur between April and November. Annual average rainfall and evaporation are 1046 mm and 1954 mm, respectively. Climate change scenarios based on application of average changes to precipitation and evaporation rates from the Queensland Future Climate Change Models (State of Queensland 2022) are detailed in **Appendix 4**.



Source: Stone *et al.* (2019)

Graph 1: Monthly rainfall, evaporation and temperature statistics for Mount Carbine

Topography

Topography in the area (**Plate 5**) is described as varying between level alluvial plains rising to short gently sloping pediments and foot-slopes to high hilly to mountainous lands with very steep slopes (Northcote *et al.*, 1960–1968). Elevation ranges between (approximately) 360 m and 490 m Australian Height Datum (AHD).

1.1.2.1. Land

Geology and soil

Mount Carbine is located in the Siluro-Devonian Hodgkinson sedimentary province of north-eastern Queensland. The sediments were complexly folded and regionally metamorphosed prior to and during extensive granitic intrusion in the Carboniferous and Permian periods. The area is underlain by the Hodgkinson Basin meta-greywackes and meta-argillites with local meta-basalts (greenschist facies). The geology, as described by the Rumula 1:100,000 scale geological map (Bultitude *et al.* 1999) is shown in **Plate 6** and the main rock units are listed in **Table 1**. Geology of the mine site is dominated by the Hodgkinson Formation, recent alluvium, and old mine workings (Bultitude *et al.* 1999). Tungsten deposits at Mount Carbine are typically associated with sheeted quartz vein systems related to hydrothermal activity from underlying intrusive granite formations (Blanchard & Brock 1984).

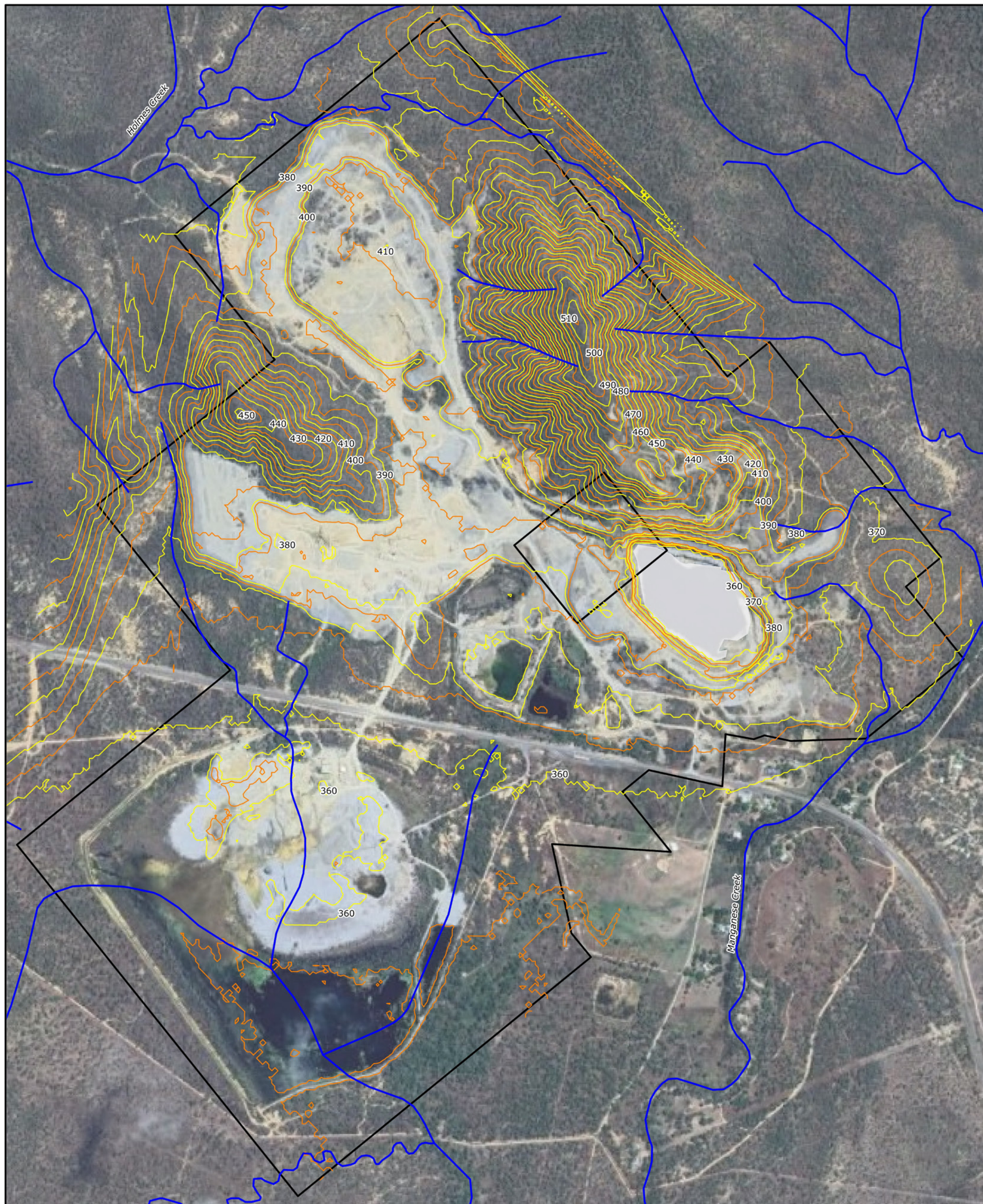
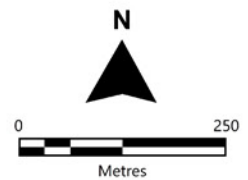


Plate 5: Mt Carbine Tungsten Project topography

Project: PRCP

-  Mining lease
-  Drainage
- Contours
 -  5 m interval
 -  10 m interval



Source: DoR 2022, EQR 2021, Google Earth 2022.

NRA Ref: 380018.01
Date: October 2023



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Recommended print size: A3

This geological map of the Mount Carbine area displays several geological units: Pgaa (red), Qhh (light green), TQf (orange dotted), Qha (white), Qf (yellow), and Dh (various shades of blue). Faults are indicated by dashed lines with arrows showing movement. Topographic features include Whisky Creek, Manganese Creek, and the One Mile Creek. The map also shows a road and various numbered points (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100). The map is overlaid with a grid.

Plate 6: Site geology

Unit	Description
Dh _b	Dark green, fine coarse-grained, massive to locally amygdaloidal metabasalt; generally altered, poorly exposed; minor chert.
Dh _c	Pale to dark grey, black, reddish brown or white, thin-bedded or massive chert (locally manganeseiferous); minor mudstone, siliceous mudstone, shale, jasper, metabasalt, iron stone.
Dh _h	Indurated arenite and 'spotted' mudstone, andalusite-cordierite (generally altered)-mica hornfels, minor schists, calc-silicate (skarn) rocks, metabasalt.
Dh _m	Brownish to dark grey, laminated to a thin-bedded mudstone and subordinate siltstone, claystone: minor fine to medium-grained arenite, chert, metabasalt.
DH _{mc}	Interbedded chert and mudstone.
Pg _{aa}	Cream to white or pale grey, medium-grained, slightly to moderately porphyritic (biotite) garnet-tourmaline-muscovite monzogranite miarolitic cavities common.

Unit	Description
Pgwa	White, medium to coarse grained, porphyritic (garnet-tourmaline-) muscovite-biotite monzogranite with pegmatitic lenses, quartz-tourmaline aggregates and sparse, small mafic inclusions; locally foliated; minor microgranite, pegmatite, Altered muscovite-biotite monzogranite.
Qa	Sand, gravel, clay; mud, silt; mainly older alluvial and minor colluvial deposits; some active stream bed deposits.
Qf	Rock debris, muddy sand, sandy and muddy gravel; mainly alluvial fan (sheetwash) deposits developed on steeply to gently sloping surfaces.
Qha	Fine to coarse sand; minor gravel, mud, silt, clay; mainly active stream-channel deposits.
Qhh	Mud, sand, gravel; mine tailings.
TQf	Rock debris, sandy and silty gravel, sand, silt, clay, mud; mainly older alluvial-fan (sheetwash) and talus deposits.

Source: Bultitude *et al.* (1999)

Landscape context

The project operations are on land disturbed by mining activities (historical and contemporary).

The land characteristics for the area have been described in the Environmental Management Plan (EM Plan) for the Mount Carbine mining project (NRA 2013) and 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, with low intensity beef cattle grazing, and residential in the township of Mount Carbine.
- Land suitability (based on pre-disturbed areas) is Class 4 on flatter areas, and Class 5 on steeper areas.

Matters of State Environmental Significance (MSES) are mapped for the project area (DES 2022a). 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), essential habitat (MSES 8d) and regulated vegetation associated with a watercourse (MSES 8e). Some of the mapping is not consistent with on-ground conditions; *eg* the regulated vegetation associated with a watercourse (MSES 8e) does not exist due to 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).

The mine and quarry activities occur on disturbed lands.

Flora

Threatened Ecological Communities

Threatened Ecological Communities (TECs) are regulated under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). No TECs occur within the project area.

Regional Ecosystems

Vegetation communities mapped by DES (2023a) in the project area are presented in **Figure 1**. The REs mapped in the project area are categorised as ‘Least Concern’ under the Queensland

Vegetation Management Act 1994 (VM Act). REs also have a Biodiversity Status for planning purposes. The Biodiversity Status for the REs in the Project area is 'No concern at present' except for RE 9.3.3c, which is 'Of Concern'.

Threatened and Near Threatened flora

The project area is not shown as being in a *high risk area* on the Protected Plants Flora Survey Trigger Map (NRA 2023a). One Threatened and Near Threatened (T/NT)² flora species was identified as having a moderate likelihood of occurrence:

- *Acacia guymeri* (Near Threatened, NC Act).

No T/NT flora were detected in the project area by NRA (2023).

² T/NT flora and fauna are species listed under the Queensland *Nature Conservation Act* 1992 (NC Act) and/or Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) as Critically Endangered, Endangered, Vulnerable, or Near Threatened, current as at 26 October 2023.

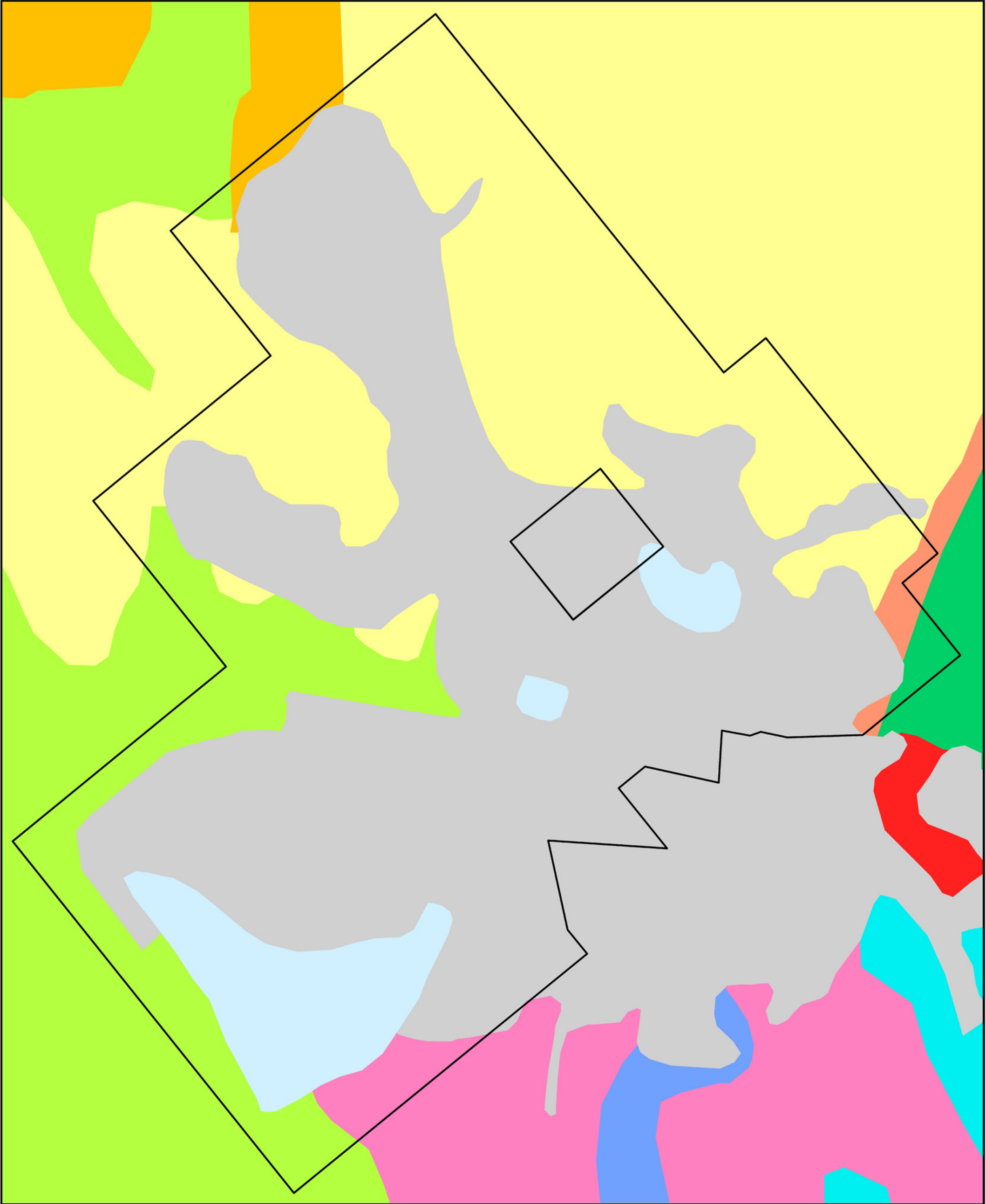
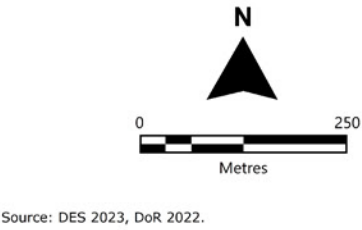
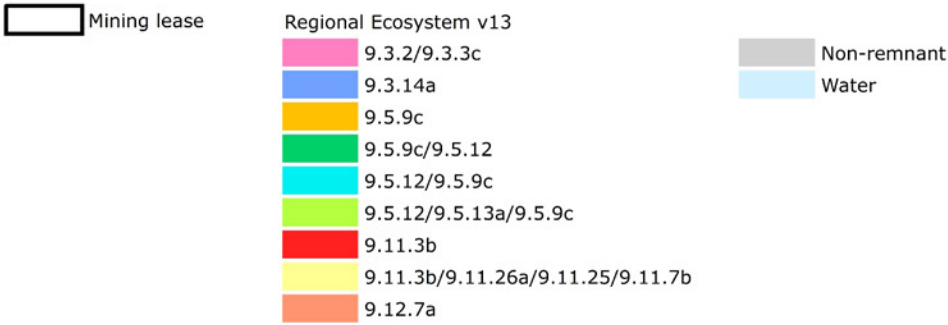


Figure 1: Regional Ecosystems
Project: Mt Carbine Project Progressive Rehabilitation and Closure Plan



Weeds

The following weeds listed as *Restricted Matter* under the *Biosecurity Act 2014* (Biosecurity Act) have been recorded by DES (2021) and/or are known to occur within 1 km of the project area.

- *Chromolaena odorata* (Siam Weed).
- *Cryptostegia grandiflora* (Rubber Vine).
- *Opuntia tomentosa* (Velvety Tree Pear).

Fauna habitats

Three Broad Vegetation Groups (BVGs) (1:2M) are mapped to occur in the project area. The BVGs are shown on **Figure 2** with descriptions reproduced from Neldner (2023) as follows:

- BVG 9 – ‘Moist to dry eucalypt open forests to woodlands usually on coastal lowlands and ranges’
- BVG 13 – ‘Dry to moist eucalypt woodlands and open forests, mainly on undulating to hilly terrain of mainly metamorphic and acid igneous rocks’
- BVG 18 – ‘Dry eucalypt woodlands to open woodlands primarily on sandplains or depositional plains’.

Habitats in the project area are generally in poor condition; the majority of habitats are disturbed, with conspicuous weed invasion (NRA 2023a).

Threatened, Near Threatened and Special Least Concern fauna

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) and essential habitat (MSES 8d). The mine and quarry activities occur on disturbed lands. The following species, listed as T/NT³ or Special Least Concern under the *Nature Conservation Act 1992* (NC Act), have historical records within and/or adjacent to the project area, and are identified in DoR (2022) and/or DES (2022a).

- *Turnix olivii* (Buff-breasted Button-quail, Critically Endangered).
- *Rostratula australis* (Australian Painted Snipe, Endangered).
- *Calidris ferruginea* (Curlew Sandpiper, Critically 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).
- *Tringa stagnatilis* (Marsh Sandpiper, Special Least Concern).

³ Threatened or Near Threatened. Threatened categories include Critically Endangered, Endangered and Vulnerable, current as at 23 October 2023.

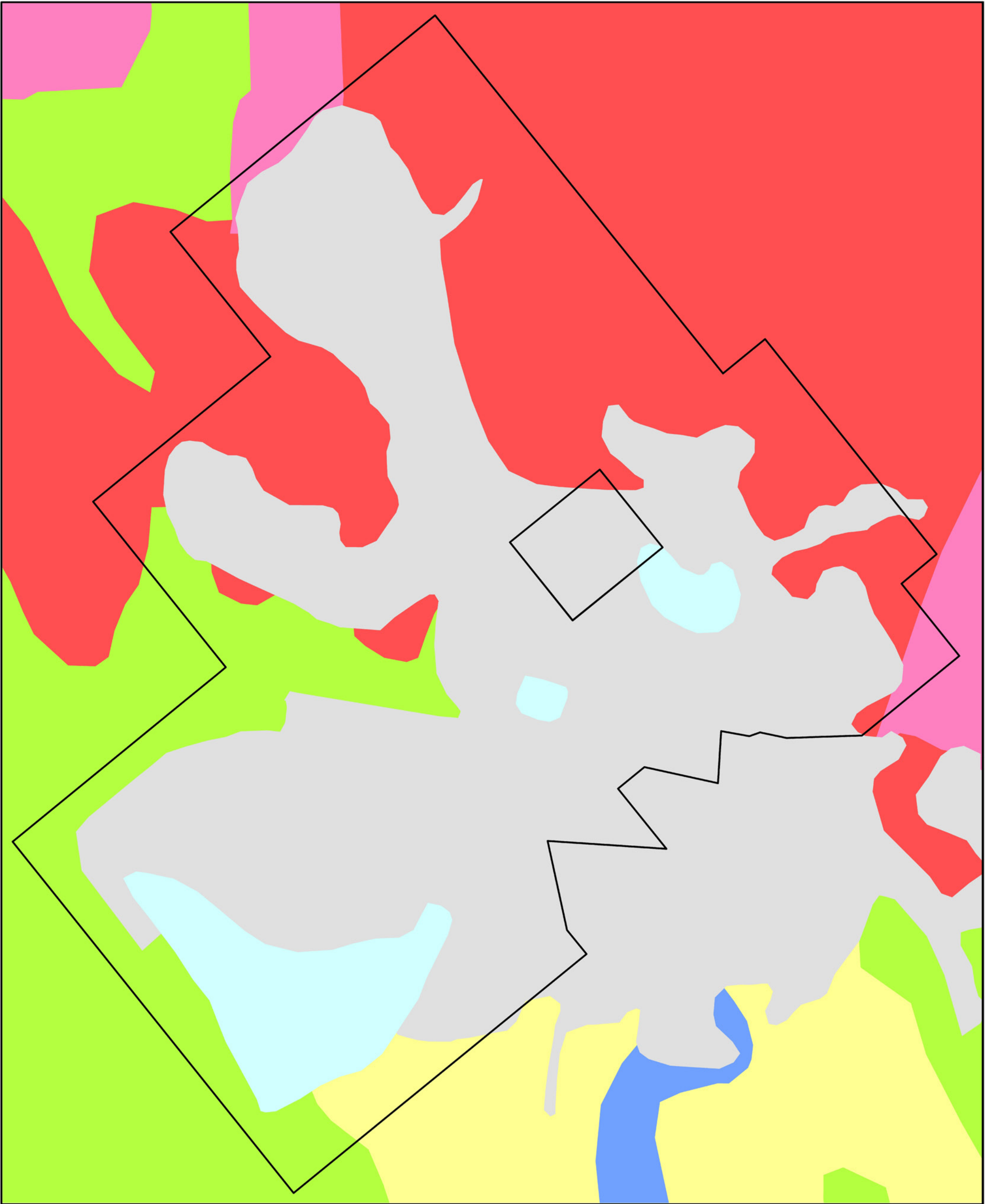
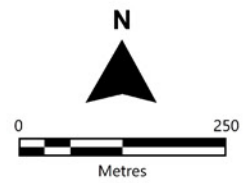


Figure 2: Broad Vegetation Groups
Project: Mt Carbine Project Progressive Rehabilitation and Closure Plan

-  Mining lease
- Broad Vegetation Group v6
-  16
 -  18
 -  22
 -  9
 -  Non-remnant
 -  Water



Source: DES 2023, DoR 2022.

NRA Ref: 380018.01
Date: October 2023



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Recommended print size: A3

Habitats within the project area are considered unlikely to support T/NT or Special Least Concern fauna on any regular basis. The areas mapped as essential habitat for *Rostratula australis* (Australian Painted Snipe) and *Calidris ferruginea* (Curlew Sandpiper) were confirmed to contain no wetland features that would support these species. The remnant vegetation in the south near TSF4, which is mapped as essential habitat for *Turnix olivii* (Buff-breasted Button-quail), contains marginal habitat for *Turnix* sp. (woodland with a dense ground layer dominated by an equal mix of tall grasses and exotic shrubs (*Stylosanthes* sp.)). Furthermore, a recent study by Webster *et al.* (2022) has cast doubt on the validity of records of *Turnix olivii* south of Cooktown, citing likely confusion with *Turnix varius* (Painted Button-quail)⁴.

Fauna breeding places

The presence of potential fauna breeding places, including a likely inactive bird nest and hollow-bearing trees were reported in the project area by NRA (2023).

Pest species

The following pests listed as *Restricted Matter* under the Biosecurity Act have been recorded by DES (2021) and/or are known to occur within 1 km of the project area.

- *Felis catus* (Cat).
- *Oryctolagus cuniculus* (Rabbit).
- *Sus scrofa* (Pig).

1.1.2.2. Water

The project site is within the Manganese Creek and Holmes Creek catchments, which drain to the Mitchell River approximately 5 km downstream of ML 4867. Manganese Creek and Holmes Creek are intermittent watercourses that are dry for most of the year.

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

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

Based on the review of the quality of receiving surface water 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 aquatic ecosystems, as defined in the Queensland *Environmental Protection (Water and Wetland Biodiversity) Policy* 2019.

Considering the above information, and as identified in the project's Receiving Environment Monitoring Program (REMP) (NRA 2024a), the nominated EVs for the receiving environment are:

- aquatic ecosystems—moderately disturbed systems
- human use:
 - primary industries—livestock drinking water

⁴ Least Concern, NC Act, current as at 23 October 2023.

- cultural and spiritual values
- recreation and aesthetics
- industrial use.

Surface water on-site is contained in existing water storages (refer to **Appendix 1** for detailed account).

Aquatic macroinvertebrates monitored during the 2023–2024 reporting period for the Mt Carbine Tungsten Project REMP indicated no discernible negative impact on the aquatic ecosystem EV that could be directly attributable to the contemporary mining activities (NRA 2024b), consistent with preceding REMP reports (including NRA 2014, 2019, 2020c, 2021b, 2022a, 2023b).

Hydrology

The Mitchell River, Manganese Creek and Holmes Creek are the main water courses in the Mount Carbine area. Manganese and Holmes creeks drain to the Mitchell River. Mitchell River usually flows year-round. Manganese and Holmes creeks are ephemeral and typically only flow in the wet season.

Flooding potential

There is currently no risk mapping of a 1% annual exceedance probability flood event for the Mount Carbine area (<https://floodcheck.information.qld.gov.au/>).

Groundwater

The groundwater conceptual model for the Mt Carbine project (RLA & Hydrogeologist 2022, **Appendix 2**)⁵ provides a contemporary account of the hydrogeology, summarised in the following.

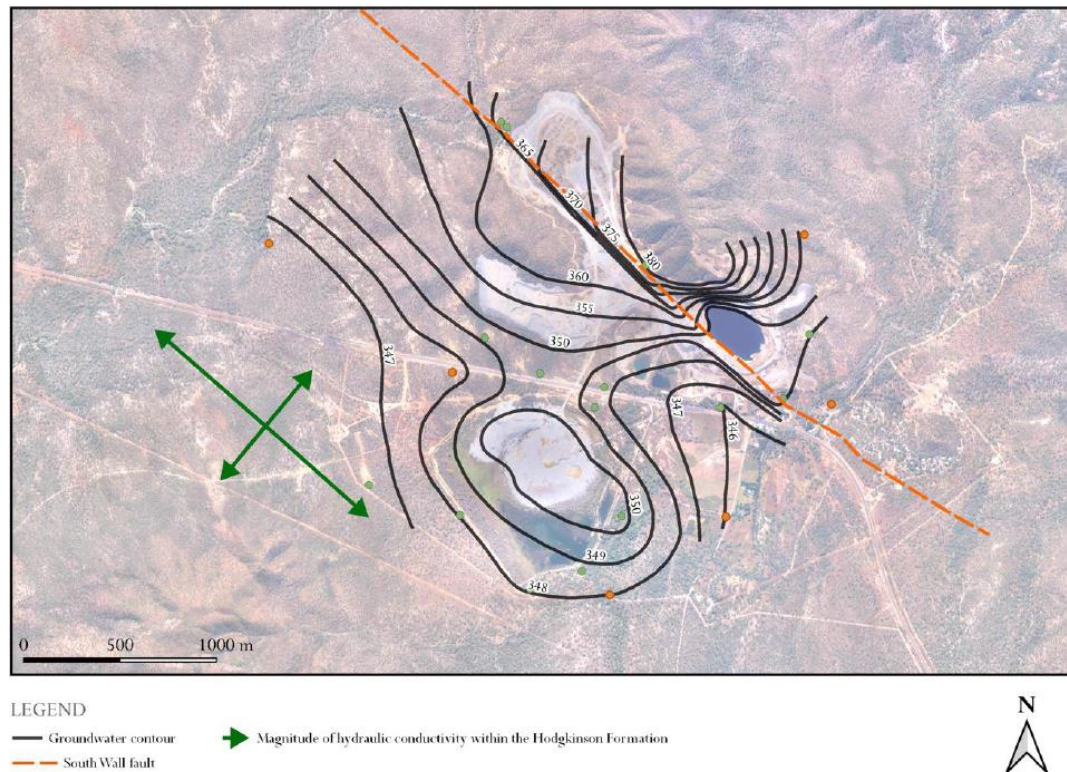
Hydro-stratigraphic units

There is little or no development of alluvial sediments within the Mount Carbine project site. As such the alluvium is not regarded as a hydro-stratigraphic unit within the project site. Groundwater is present as an unconfined aquifer where it occurs within the regolith; the regolith is typically unsaturated across the site. The primary hydro-stratigraphic unit at Mount Carbine occurs within the Hodgkinson Formation. The fractured rocks of the Hodgkinson Formation comprise a secondary porosity aquifer. Drilling within the Hodgkinson Formation indicates discrete zones of moderate to high hydraulic conductivity within a generally low hydraulic conductivity rock mass. Groundwater within the Hodgkinson Formation is interpreted to be semi-confined at shallow depths and confined at deeper depths. The South Wall Fault (SWF), exposed in the south-western wall of the open pit where the clay layer has been removed by mining, is assessed to be an aquitard or a leaky barrier to groundwater flow. This implies that there is limited opportunity for groundwater flow across the SWF owing to the retarding effect of the clay layer that lines the fault plane. It does not imply total exclusion of groundwater flow across and along the SWF.

⁵ The concept model was developed by two independent principal level hydrogeologists, following consultation with the AA, additional field investigation (including the drilling of additional bores to the existing monitoring network, monitoring and sampling), and data analysis with contributions from a principal level geologist.

Groundwater levels and flow

While no pre-mine groundwater levels are available, groundwater levels pre-expansion of the open pit in 1982 (Piteau & Associates 1982) indicates groundwater elevations in the range of 359–365 mAHD. Groundwater levels have been measured within the dedicated groundwater monitoring bores since they were installed in November 2011 and in additional bores established in 2022. A potentiometric surface contour map of groundwater elevations is shown in **Plate 7**.



Source: RLA & Hydrogeologist 2022

Plate 7: Potentiometric contour map

The potentiometric contours potentially indicate the presence of separate hydro-stratigraphic units on either side of the SWF. To the south-west of the SWF, the contours are flatter, and the hydraulic gradient is lower. To the north-east of the SWF, the contours are steeper, and the hydraulic gradient is higher. These separate hydro-stratigraphic units relate primarily to the bulk rock mass hydraulic conductivity of the Hodgkinson Formation, which is likely to be influenced by the presence of the SWF and also by the presence of the felsic dykes to the north of the SWF and adjacent to the open pit. There is also expected to be a topographic influence, with the region to the north-east of the SWF having higher elevation than the area to the south-west. It is also apparent from the potentiometric surface contours that the TSF4 is leaking, and a localised groundwater mound has formed; this is a circumstance that would have prevailed from the outset (*ie* 1970s) as a direct result of accepted standards, methods and practices, and was reported in the Decommissioning and Rehabilitation Plan accepted by the AA in 1995 (**Appendix 9, Attachment 3**). Aquatic macroinvertebrates monitored during the 2023–2024 reporting period for the Mt Carbine Tungsten Project REMP indicated no discernible negative impact on the aquatic ecosystem EV that could be directly attributable to the contemporary mining activities (NRA 2024b), consistent with preceding REMP reports (including NRA 2014, 2019, 2020c, 2021b, 2022a, 2023b). For the duration of mining operations, the existing management measures in accordance with the EA EPML00956913 apply. Following cessation of mining, TSF4 will remain as a component of the quarry operations, the mineral processing plant-related infrastructure that is located on the area of TSF4 having been removed;

rehabilitation milestones and criteria for TSF4 are included in the PRCP Schedule (**Appendix 6**).

Groundwater recharge

The primary mechanism for recharge to the aquifers in the area is the direct infiltration of rainfall. Recharge to the Hodgkinson Formation will be rapid in areas where open cleavage partings are both exposed at the surface and persist to depth. A secondary mechanism for recharge to the aquifers at Mount Carbine is episodic or runoff recharge.

Groundwater discharge

Groundwater discharge is potentially occurring between the low-grade stockpile and Holmes Creek. Previous REMPs have reported Pandanus vegetation in this locale which is indicative of wet soil conditions. There is not necessarily any physical discharge of groundwater seepage occurring at this site; rather, there is potential for sub-surface seepage.

Groundwater quality

The salinity and groundwater chemistry across the site is variable and does not readily present any spatial trends or obvious water types. There is a potential clustering of lower chloride/lower bicarbonate groundwater to the north-east of the SWF, and higher chloride/higher bicarbonate groundwater to the south-west of the SWF. Refer to **Background water quality** for a summation of data.

Wetlands and groundwater dependent ecosystems

Wetlands

There are no wetlands of national or international significance mapped in the project site or the receiving environment (DES 2022b). There are no High Ecological Value Waters (watercourse), High Ecological Value Waters (wetland) or wetlands of High Ecological Significance mapped in the project site or the receiving environment⁶ (DES 2022b).

Groundwater dependent ecosystems

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 Mount Carbine township and also further south of the project site along the Mitchell River (BoM 2023). 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, along with ‘moderate potential’ terrestrial GDEs further south of the project site, and ‘low potential’ terrestrial GDEs in the project site, north of the quarry areas (BoM 2023). Groundwater values for the Mt Carbine mining project have been identified as stock watering and firefighting (NRA 2013).

Background water quality

Surface water

Surface water quality data has been gathered at Mount Carbine for several decades. Surface water contaminants of concern at Mount Carbine are identified in the EA. Routine surface water monitoring for the contaminants is undertaken at the EA-listed monitoring locations (EA Schedule D – Table D4) monthly (and higher frequency during releases).

⁶ The receiving environment was checked for waters within 15 km downstream of the project site.

The background surface water quality at Mount Carbine is summarised in **Table 2**.

Groundwater

Groundwater quality data has been gathered routinely at Mount Carbine since 2012. Groundwater water contaminants of interest are identified in the EA. Groundwater quality is variable. Routine groundwater monitoring for the contaminants of interest is undertaken at the EA-listed monitoring bores (EA Schedule D – Table D5) quarterly. The EA does not include reference bores.

The groundwater quality at Mount Carbine is summarised in **Table 3**.

Table 2: Mount Carbine background water quality (surface water)

Analyte	Oldest	Newest	Count	Minimum	50%ile	Maximum
SW1 – Manganese Creek Reference Site						
pH unitless	1/04/2009	1/05/2023	89	6.5	7.1	9.06
EC µS/cm	1/04/2009	1/05/2023	83	38.1	55	93
Dissolved Oxygen %sat	4/02/2022	1/05/2023	10	65.1	88.8	95.8
Turbidity NTU	28/03/2022	1/05/2023	2	19.04	22.27	25.5
Total Suspended Solids mg/L	22/03/2023	27/04/2023	2	<5.0	<5.0	<5.0
Sodium mg/L	21/01/2013	1/05/2023	76	6.3	10	15
Potassium mg/L	21/01/2013	1/05/2023	76	0.33	0.59	1
Magnesium mg/L	21/01/2013	1/05/2023	76	0.35	0.48	1
Calcium mg/L	21/01/2013	1/05/2023	76	0.64	0.81	2.2
Total alkalinity mgEqCaCO3/L	2/06/2014	1/05/2023	40	13	21	30
Chloride mg/L	21/01/2013	1/05/2023	76	4	8	18
Sulfate mg/L	8/02/2011	1/05/2023	88	<0.5	<0.5	2.3
Fluoride mg/L	8/02/2011	1/05/2023	88	0.07	0.13	0.51
Aluminium, filtered mg/L	8/02/2011	1/05/2023	88	0.022	1.5	7.2
Arsenic, filtered mg/L	8/02/2011	1/05/2023	88	0.001	<0.003	0.006
Cadmium, filtered mg/L	8/02/2011	1/05/2023	88	<0.0001	<0.0001	0.0001
Cobalt, filtered mg/L	8/02/2011	1/05/2023	88	<0.001	<0.001	<0.005
Copper, filtered mg/L	8/02/2011	1/05/2023	88	<0.001	<0.001	0.002
Manganese, filtered mg/L	8/02/2011	1/05/2023	87	<0.005	<0.005	0.013
Molybdenum, filtered mg/L	8/02/2011	1/05/2023	87	<0.001	<0.001	<0.01
Tungsten, filtered mg/L	31/03/2011	1/05/2023	73	<2e-06	<0.0005	0.0011
Zinc, filtered mg/L	8/02/2011	1/05/2023	88	<0.005	<0.005	0.018
SW16 – Holmes Creek Reference Site						
pH unitless	5/06/2013	1/05/2023	30	6.6	7.1	7.45
EC µS/cm	5/06/2013	1/05/2023	25	46	61.9	120
Dissolved Oxygen %sat	9/02/2022	1/05/2023	5	59.4	64.8	92.2
Turbidity NTU	4/01/2017	1/05/2023	8	1.6	8.96	15
Sodium mg/L	5/06/2013	1/05/2023	30	6.4	10	16
Potassium mg/L	5/06/2013	1/05/2023	30	0.5	0.67	1.1
Magnesium mg/L	5/06/2013	1/05/2023	30	0.6	0.81	2.1
Calcium mg/L	5/06/2013	1/05/2023	30	0.8	1.1	2.8
Total alkalinity mgEqCaCO3/L	3/06/2014	1/05/2023	15	10	22	37
Chloride mg/L	5/06/2013	1/05/2023	30	6	8	20
Sulfate mg/L	5/06/2013	1/05/2023	30	<0.5	0.8	1.7
Fluoride mg/L	5/06/2013	1/05/2023	30	0.1	0.16	0.48
Aluminium, filtered mg/L	5/06/2013	1/05/2023	30	0.021	0.66	1.7
Arsenic, filtered mg/L	5/06/2013	1/05/2023	30	0.004	0.007	0.019
Cadmium, filtered mg/L	5/06/2013	1/05/2023	30	<0.0001	<0.0001	0.0001
Cobalt, filtered mg/L	5/06/2013	1/05/2023	30	<0.001	<0.001	<0.001
Copper, filtered mg/L	5/06/2013	1/05/2023	30	<0.001	<0.001	0.004
Manganese, filtered mg/L	5/06/2013	1/05/2023	30	<0.005	<0.005	0.045
Molybdenum, filtered mg/L	5/06/2013	1/05/2023	30	<0.001	<0.001	<0.005
Tungsten, filtered mg/L	5/06/2013	1/05/2023	30	<0.0005	0.0006	<0.001
Zinc, filtered mg/L	5/06/2013	1/05/2023	30	<0.005	<0.005	0.006

Table 3: Mount Carbine background water quality (groundwater)

Bore	Analyte	Oldest	Newest	Count	Minimum	50%ile	Maximum
IB03	Aluminium, filtered mg/L	31/01/2022	14/06/2023	14	<0.005	0.033	0.2
IB03	Arsenic, filtered mg/L	31/01/2022	14/06/2023	14	<0.001	<0.003	0.003
IB03	Cadmium, filtered mg/L	31/01/2022	14/06/2023	14	0.0002	0.0003	0.0005
IB03	Cobalt, filtered mg/L	31/01/2022	14/06/2023	14	<0.001	<0.001	0.003
IB03	Copper, filtered mg/L	31/01/2022	14/06/2023	14	<0.001	<0.001	0.007
IB03	EC µS/cm	31/01/2022	14/06/2023	14	7340	8945	9780
IB03	Fluoride mg/L	31/01/2022	14/06/2023	14	1.6	1.8	2
IB03	Manganese, filtered mg/L	31/01/2022	14/06/2023	14	0.044	0.11	1.3
IB03	Molybdenum, filtered mg/L	31/01/2022	14/06/2023	14	<0.001	0.001	0.002
IB03	pH unitless	31/01/2022	14/06/2023	14	6.3	6.49	7.48
IB03	Sulfate mg/L	31/01/2022	14/06/2023	14	220	260	310
IB03	Tungsten, filtered mg/L	31/01/2022	14/06/2023	14	<0.0005	0.001	0.0021
IB03	Zinc, filtered mg/L	31/01/2022	14/06/2023	14	<0.005	<0.005	0.053
IB04	Aluminium, filtered mg/L	31/01/2022	14/06/2023	14	<0.005	0.021	0.073
IB04	Arsenic, filtered mg/L	31/01/2022	14/06/2023	14	0.004	0.026	0.13
IB04	Cadmium, filtered mg/L	31/01/2022	14/06/2023	14	<0.0001	<0.0001	0.0003
IB04	Cobalt, filtered mg/L	31/01/2022	14/06/2023	14	0.002	0.004	0.006
IB04	Copper, filtered mg/L	31/01/2022	14/06/2023	14	<0.001	<0.001	0.005
IB04	EC µS/cm	31/01/2022	14/06/2023	14	1800	2380	2590
IB04	Fluoride mg/L	31/01/2022	14/06/2023	14	1.8	2	2.8
IB04	Manganese, filtered mg/L	31/01/2022	14/06/2023	14	0.47	2.4	3
IB04	Molybdenum, filtered mg/L	31/01/2022	14/06/2023	14	<0.001	<0.001	0.001
IB04	pH unitless	31/01/2022	14/06/2023	14	6.37	6.72	7.64
IB04	Sulfate mg/L	31/01/2022	14/06/2023	14	250	290	340
IB04	Tungsten, filtered mg/L	31/01/2022	14/06/2023	14	0.0017	0.002	0.012
IB04	Zinc, filtered mg/L	31/01/2022	14/06/2023	14	<0.005	<0.005	0.065
IB06	Aluminium, filtered mg/L	2/02/2022	14/06/2023	14	<0.005	0.018	0.73
IB06	Arsenic, filtered mg/L	2/02/2022	14/06/2023	14	0.002	0.091	0.13
IB06	Cadmium, filtered mg/L	2/02/2022	14/06/2023	14	<0.0001	<0.0001	<0.0001
IB06	Cobalt, filtered mg/L	2/02/2022	14/06/2023	14	<0.001	<0.001	0.001
IB06	Copper, filtered mg/L	2/02/2022	14/06/2023	14	<0.001	<0.001	0.005
IB06	EC µS/cm	2/02/2022	14/06/2023	14	4020	5295	6000
IB06	Fluoride mg/L	2/02/2022	14/06/2023	14	0.26	1.8	2.1
IB06	Manganese, filtered mg/L	2/02/2022	14/06/2023	14	0.007	0.06	0.2
IB06	Molybdenum, filtered mg/L	2/02/2022	14/06/2023	14	<0.001	0.002	0.003
IB06	pH unitless	2/02/2022	14/06/2023	14	6.64	7	7.74
IB06	Sulfate mg/L	2/02/2022	14/06/2023	14	120	140	150
IB06	Tungsten, filtered mg/L	2/02/2022	14/06/2023	14	<0.001	0.001	0.0018
IB06	Zinc, filtered mg/L	2/02/2022	14/06/2023	14	<0.005	<0.005	0.01
IB08	Aluminium, filtered mg/L	31/01/2022	14/06/2023	14	0.007	0.027	0.89
IB08	Arsenic, filtered mg/L	31/01/2022	14/06/2023	14	0.004	0.46	0.5
IB08	Cadmium, filtered mg/L	31/01/2022	14/06/2023	14	0.0001	0.0003	0.0004
IB08	Cobalt, filtered mg/L	31/01/2022	14/06/2023	14	<0.001	0.001	0.002
IB08	Copper, filtered mg/L	31/01/2022	14/06/2023	14	<0.001	<0.001	0.003
IB08	EC µS/cm	31/01/2022	14/06/2023	14	1700	2370	2740
IB08	Fluoride mg/L	31/01/2022	14/06/2023	14	0.67	3.6	4.3
IB08	Manganese, filtered mg/L	31/01/2022	14/06/2023	14	0.13	0.49	0.56
IB08	Molybdenum, filtered mg/L	31/01/2022	14/06/2023	14	<0.001	0.007	0.013
IB08	pH unitless	31/01/2022	14/06/2023	14	6.11	6.79	8.06
IB08	Sulfate mg/L	31/01/2022	14/06/2023	14	110	120	140
IB08	Tungsten, filtered mg/L	31/01/2022	14/06/2023	14	<0.0005	0.002	0.004
IB08	Zinc, filtered mg/L	31/01/2022	14/06/2023	14	<0.005	0.007	0.04
MB1A	Aluminium, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	0.014	0.034
MB1A	Arsenic, filtered mg/L	5/01/2012	21/03/2023	56	<0.003	0.004	0.015
MB1A	Cadmium, filtered mg/L	5/01/2012	21/03/2023	56	<0.0001	<0.0001	0.0002
MB1A	Cobalt, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	<0.001	<0.005
MB1A	Copper, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	<0.001	0.003
MB1A	EC µS/cm	5/01/2012	21/03/2023	56	1600	1800	2010
MB1A	Fluoride mg/L	5/01/2012	21/03/2023	56	0.6	0.84	1.1
MB1A	Manganese, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	0.038	0.24
MB1A	Molybdenum, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	0.002	<0.01
MB1A	pH unitless	5/01/2012	21/03/2023	56	6.38	7.4	7.9
MB1A	Sulfate mg/L	5/01/2012	21/03/2023	56	29	35	48
MB1A	Tungsten, filtered mg/L	5/06/2013	21/03/2023	45	<0.0005	0.0011	0.024
MB1A	Zinc, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	0.007	0.081
MB1B	Aluminium, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	0.03	0.11
MB1B	Arsenic, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	0.008	0.011
MB1B	Cadmium, filtered mg/L	5/01/2012	21/03/2023	56	<0.0001	<0.0001	0.0003
MB1B	Cobalt, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	<0.001	<0.005
MB1B	Copper, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	0.002	0.004
MB1B	EC µS/cm	5/01/2012	21/03/2023	56	720	1300	3910
MB1B	Fluoride mg/L	5/01/2012	21/03/2023	56	0.65	1.3	3.7
MB1B	Manganese, filtered mg/L	5/01/2012	21/03/2023	55	<0.005	0.017	0.73
MB1B	Molybdenum, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	0.028	0.033
MB1B	pH unitless	5/01/2012	21/03/2023	56	6.28	8	9.1
MB1B	Sulfate mg/L	5/01/2012	21/03/2023	56	22	46	67
MB1B	Tungsten, filtered mg/L	5/06/2013	21/03/2023	45	<0.0005	0.0094	0.033
MB1B	Zinc, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	<0.005	0.099
MB3A	Aluminium, filtered mg/L	5/01/2012	22/03/2023	54	<0.005	0.01	0.046
MB3A	Arsenic, filtered mg/L	5/01/2012	22/03/2023	54	0.004	0.05	0.23
MB3A	Cadmium, filtered mg/L	5/01/2012	22/03/2023	54	<0.0001	0.0001	0.005
MB3A	Cobalt, filtered mg/L	5/01/2012	22/03/2023	54	<0.001	<0.001	<0.005
MB3A	Copper, filtered mg/L	5/01/2012	22/03/2023	54	<0.001	<0.001	0.008
MB3A	EC µS/cm	5/01/2012	22/03/2023	54	700	750	820

Bore	Analyte	Oldest	Newest	Count	Minimum	50%ile	Maximum
MB3A	Fluoride mg/L	5/01/2012	22/03/2023	54	2.9	3.5	5.3
MB3A	Manganese, filtered mg/L	5/01/2012	22/03/2023	54	0.026	0.18	0.97
MB3A	Molybdenum, filtered mg/L	5/01/2012	22/03/2023	54	<0.001	0.002	0.01
MB3A	pH unitless	5/01/2012	22/03/2023	54	6.29	7	8.3
MB3A	Sulfate mg/L	5/01/2012	22/03/2023	54	31	44	83
MB3A	Tungsten, filtered mg/L	5/06/2013	22/03/2023	44	0.0007	0.035	0.062
MB3A	Zinc, filtered mg/L	5/01/2012	22/03/2023	54	<0.005	<0.005	0.18
MB3B	Aluminium, filtered mg/L	5/01/2012	22/03/2023	55	<0.005	0.012	0.048
MB3B	Arsenic, filtered mg/L	5/01/2012	22/03/2023	55	0.004	0.025	0.044
MB3B	Cadmium, filtered mg/L	5/01/2012	22/03/2023	55	<0.0001	0.0001	0.0002
MB3B	Cobalt, filtered mg/L	5/01/2012	22/03/2023	55	<0.0001	<0.001	<0.005
MB3B	Copper, filtered mg/L	5/01/2012	22/03/2023	55	<0.001	<0.001	0.003
MB3B	EC µS/cm	5/01/2012	22/03/2023	55	630	780	890
MB3B	Fluoride mg/L	5/01/2012	22/03/2023	55	1.1	4	8.9
MB3B	Manganese, filtered mg/L	5/01/2012	22/03/2023	55	<0.005	0.21	0.86
MB3B	Molybdenum, filtered mg/L	5/01/2012	22/03/2023	55	<0.001	0.11	0.2
MB3B	pH unitless	5/01/2012	22/03/2023	55	7.09	7.8	10.3
MB3B	Sulfate mg/L	5/01/2012	22/03/2023	55	13	90	130
MB3B	Tungsten, filtered mg/L	5/06/2013	22/03/2023	44	<0.001	0.046	0.53
MB3B	Zinc, filtered mg/L	5/01/2012	22/03/2023	55	<0.005	<0.005	0.02
MB4A	Aluminium, filtered mg/L	5/01/2012	22/03/2023	55	<0.005	0.007	0.046
MB4A	Arsenic, filtered mg/L	5/01/2012	22/03/2023	55	0.005	0.007	0.01
MB4A	Cadmium, filtered mg/L	5/01/2012	22/03/2023	55	<0.0001	<0.0001	0.0002
MB4A	Cobalt, filtered mg/L	5/01/2012	22/03/2023	55	<0.001	<0.001	0.007
MB4A	Copper, filtered mg/L	5/01/2012	22/03/2023	55	<0.001	<0.001	0.002
MB4A	EC µS/cm	5/01/2012	22/03/2023	55	1470	1600	2800
MB4A	Fluoride mg/L	5/01/2012	22/03/2023	55	1.4	3	4.1
MB4A	Manganese, filtered mg/L	5/01/2012	22/03/2023	55	<0.005	0.03	0.91
MB4A	Molybdenum, filtered mg/L	5/01/2012	22/03/2023	55	<0.001	0.002	<0.01
MB4A	pH unitless	5/01/2012	22/03/2023	55	6.83	7.6	8.7
MB4A	Sulfate mg/L	5/01/2012	22/03/2023	55	170	230	350
MB4A	Tungsten, filtered mg/L	5/06/2013	22/03/2023	44	<0.0005	0.0054	0.021
MB4A	Zinc, filtered mg/L	5/01/2012	22/03/2023	55	<0.005	<0.005	0.029
MB4B	Aluminium, filtered mg/L	5/01/2012	22/03/2023	55	<0.005	0.013	0.045
MB4B	Arsenic, filtered mg/L	5/01/2012	22/03/2023	55	0.004	0.008	0.036
MB4B	Cadmium, filtered mg/L	5/01/2012	22/03/2023	55	<0.0001	<0.0001	0.0003
MB4B	Cobalt, filtered mg/L	5/01/2012	22/03/2023	55	<0.001	<0.001	0.006
MB4B	Copper, filtered mg/L	5/01/2012	22/03/2023	55	<0.001	<0.001	0.002
MB4B	EC µS/cm	5/01/2012	22/03/2023	55	1700	2600	5700
MB4B	Fluoride mg/L	5/01/2012	22/03/2023	55	0.8	3.3	4.7
MB4B	Manganese, filtered mg/L	5/01/2012	22/03/2023	55	<0.005	0.044	7.4
MB4B	Molybdenum, filtered mg/L	5/01/2012	22/03/2023	55	<0.001	0.002	<0.01
MB4B	pH unitless	5/01/2012	22/03/2023	55	6.78	7.7	8.4
MB4B	Sulfate mg/L	5/01/2012	22/03/2023	55	79	300	360
MB4B	Tungsten, filtered mg/L	5/06/2013	22/03/2023	44	<0.0005	0.0076	0.03
MB4B	Zinc, filtered mg/L	5/01/2012	22/03/2023	55	<0.005	<0.005	0.048
MB5A	Aluminium, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	0.011	0.031
MB5A	Arsenic, filtered mg/L	5/01/2012	21/03/2023	56	<0.003	0.005	0.008
MB5A	Cadmium, filtered mg/L	5/01/2012	21/03/2023	56	<0.0001	<0.0001	0.0002
MB5A	Cobalt, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	<0.001	0.007
MB5A	Copper, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	<0.001	0.003
MB5A	EC µS/cm	5/01/2012	21/03/2023	56	1950	2100	2200
MB5A	Fluoride mg/L	5/01/2012	21/03/2023	56	1.1	1.4	2.7
MB5A	Manganese, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	0.021	1.1
MB5A	Molybdenum, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	0.002	<0.01
MB5A	pH unitless	5/01/2012	21/03/2023	56	6.25	7.2	8.2
MB5A	Sulfate mg/L	5/01/2012	21/03/2023	56	36	40	57
MB5A	Tungsten, filtered mg/L	5/06/2013	21/03/2023	45	<0.0005	<0.001	0.0067
MB5A	Zinc, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	<0.005	0.13
MB5B	Aluminium, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	0.017	0.031
MB5B	Arsenic, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	0.004	0.009
MB5B	Cadmium, filtered mg/L	5/01/2012	21/03/2023	56	<0.0001	<0.0001	0.0003
MB5B	Cobalt, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	<0.001	<0.005
MB5B	Copper, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	<0.001	0.002
MB5B	EC µS/cm	5/01/2012	21/03/2023	56	2800	2900	3200
MB5B	Fluoride mg/L	5/01/2012	21/03/2023	56	1.2	1.5	2.1
MB5B	Manganese, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	0.2	1.1
MB5B	Molybdenum, filtered mg/L	5/01/2012	21/03/2023	56	<0.001	<0.001	<0.01
MB5B	pH unitless	5/01/2012	21/03/2023	56	6.4	7.6	8.1
MB5B	Sulfate mg/L	5/01/2012	21/03/2023	56	13	18	30
MB5B	Tungsten, filtered mg/L	5/06/2013	21/03/2023	45	<0.0005	0.015	0.036
MB5B	Zinc, filtered mg/L	5/01/2012	21/03/2023	56	<0.005	0.005	0.051

Geochemistry

Characteristics of quarry material

The geochemistry of the existing quarry material has been assessed and the information included in EA amendment applications for the quarry and the mine. The relevant amendment application processes for the mine and quarry were undertaken in mid-2013 and mid-2016 respectively.

1. For the mine, approval was sought and granted for:
 - a. re-processing of existing tailings for tungsten (up to 1 million tonnes per annum)
 - b. re-processing of existing low-grade stockpiles for tungsten (up to 3 million tonnes per annum)
2. For the quarry, the source of material was from the waste rock dumps and historical tailings, and approval was granted.

In summary, the geochemistry studies undertaken indicated that the material contained in the low-grade stockpile and historical tailings dam (*ie* TSF4) was not likely to present an acidification issue. Drainage from the stockpiles was expected to be enriched in some elements to above the guideline values for the protection of environmental values in the receiving environment (*ie* slightly to moderately disturbed aquatic ecosystems and livestock drinking water). Water quality monitoring undertaken for the project confirms this. The aquatic ecosystem study undertaken by NRA in 2014, which involved assessing water quality, stream sediment, and aquatic macroinvertebrates at surface water sites within the receiving environment of the Mt Carbine mining leases, showed that no discernible difference was recorded for the aquatic macroinvertebrate community at receiving sites on Holmes and Manganese creeks compared with reference sites on the same drainages (NRA 2014). This indicated that, despite runoff and drainage from the historical mining disturbance in the catchment of Holmes and Manganese creeks for several decades, a significant impact to the environmental values of the receiving environment does not appear to have occurred. Aquatic macroinvertebrates monitored during the 2023–2024 reporting period for the Mt Carbine Tungsten Project REMP indicated no discernible negative impact on the aquatic ecosystem EV that could be directly attributable to the contemporary mining activities (NRA 2024b), consistent with preceding REMP reports (including NRA 2014, 2019, 2020c, 2021b, 2022a, 2023b).

Characteristics of open cut material

Material from the proposed open pit expansion was geochemically characterised and reported (NRA 2022b); the following is a summation.

The purpose of the work was to identify the environmental risks associated with the generation of problematic leachate by the materials to be excavated. Problematic leachate specifically includes acid mine drainage/acid rock drainage, and neutral mine drainage, as well as more generalised leachate quality issues associated with contaminants mobilised under storage conditions.

Rocks to be excavated for the pit expansion are grouped into two units: metasediments and metavolcanics. The block model prepared by Mt Carbine Quarries Pty Ltd indicated that the metasediments unit forms the bulk (89% by mass) of the material to be excavated and is from the same rock unit excavated during earlier mining activities. The metavolcanic unit forms the south-western wall of the existing pit and effectively constitutes the remaining volume of material to be excavated for the pit expansion.

The environmental risks associated with the material to be excavated were identified using a range of information. The primary information source was a geochemical characterisation program (undertaken 2021–2022) of the material to be excavated for the pit expansion. This

program was informed by existing information, which included geochemical studies undertaken in 2013 and about a decade of water quality monitoring of existing structures (eg low-grade stockpile and historical tailings dam). Samples of excavated material and by-product solids were characterised in terms of:

- acid generating potential (AGP), using acid-base accounting (ABA) and net-acid generation test (NAG test) methods
- sulfur content (SC)
- element enrichment
- analyte mobility (water-soluble and oxidation-mobilised).

Water quality data associated with the low-grade stockpile and historical tailings dam has been monitored since 2011 and 2013, respectively. This data was used to show the quality of waters associated with storage of material excavated from the Mt Carbine open pit.

Geochemical characterisation of the metasediments rock unit (89% by mass of the material to be excavated for the open expansion) from 2013 and 2022 identified all samples as non-acid forming (NAF); consequently, the metasediments rock unit has a low AGP risk. Leachate quality associated with stored metasediments material (ie the low-grade stockpile) has been monitored for approximately 10 years. The main water-quality issue for stored metasediments rock unit material is expected to be sulfate. Acidification of the leachate is not indicated.

Metavolcanics form the balance (ie 11%) of the material to be excavated for the open pit expansion. The samples analysed by the geochemical characterisation program identified that a portion of the metavolcanic rock unit has an elevated AGP risk compared to the metasediments. The main leachate quality issue for the metavolcanic rock unit is expected to be sulfate.

The ore samples were classified as Low Sulfur Non-Acid Forming (LS NAF), Low Sulfur Uncertain (LS Uc) or Significant Sulfur Uncertain (SS Uc). The highest ranked leachate quality indicator for the ore was tungsten. The environmental risk posed by tungsten is expected to be low⁷. The limited exposure of ore to leaching, relative to other excavated materials, is expected to further reduce the risk of tungsten to the environment.

By-product material (ie material remaining after the recovery of tungsten) was found to have a low AGP risk (all samples analysed were classified as LS NAF). Water quality associated with the stored by-product has been monitored for approximately 7 years. The main water quality issue for the by-product is expected to be sulfate. Acidification of waters associated with storage of the by-product is not indicated.

Ore-sorter reject samples were analysed to confirm that processing did not concentrate sulfur in the ore-sorter rejects. The ore-sorter reject samples were all low sulfur and had a low AGP risk. All samples except one were classified LS NAF; the exception was classified LS Uc.

Management of the rock excavated from the open pit focuses on maximising its beneficial reuse (eg as quarry material) and minimising risk associate with rock material that is not suitable for beneficial reuse.

⁷ A review by Han *et al.* (2021) identified that tungsten has ‘low mobility and bioavailability’ in mine wastes and ‘little toxicity to humans, animals, and plants’.

The primary beneficial reuse of excavated rock will be as quarry material by the co-located Mt Carbine Quarry. For rock to be suitable for use as quarry material it must meet the relevant requirement in the Quarry's EA (EPPR00438313, dated 16 March 2021), *ie* that the rock not be 'characterised as having acid forming potential'. 'Ore or waste rock characterised as having acid forming potential' is defined in the Quarry EA as rock having:

- a Net Acid Producing Potential (NAPP) of greater than 5 kg H₂SO₄/t
- or
- a Net Acid Generation (NAG) oxidation pH of less than 4.5 (pH unit).

Incorporation of the quarry material criteria into the block model with the geochemical characterisation information identified⁸:

- all of the metasediments (as excavated rock and as ore-sorter reject material) will be suitable for use as quarry material.
- between 2.85 and 3.25 Mt (85 to 97%) of the metavolcanics will be suitable for use as quarry material
- all by-product will be suitable for use as quarry material.

The block model indicates that 3% of the metavolcanics is not suitable for use as quarry material *ie* will be waste rock, and that an additional 12% may also be unsuitable. The waste rock may be used for construction purposes in locations commensurate with its geochemical risk (*eg* road sheeting within the open pit). The remainder of the waste rock will be stored in an engineered storage (the waste rock dump) in the catchment of the open pit to manage the risk of off-site water releases. Locating the waste rock dump close to the open pit will facilitate possible in-pit or underground disposal of waste rock during the later stages of the project. The waste rock dump will be designed to accommodate up to 0.5 Mt of material. However, it is not unlikely that the amount of waste rock in the dump will be in the order of 0.1 Mt (*ie* 3% of the metavolcanics).

Progressive characterisation will be used by EQ Resources Ltd (EQR)⁹ to validate the properties of the excavated rocks and to inform rock management. Progressive characterisation will be integrated with grade control sampling and analysis. The material identified as waste rock in the block model (0.11 Mt) and its halo (0.40 Mt) will be sampled at an intensity of (nominally) 10 m × 10 m × 5 m (width × length × height) blocks of rock approximately 2–4 weeks ahead of excavation. Zones of rock identified by the EQR geologist as other than low risk (due to the presence of sulfide minerals or other indicators of potential issues, mineralisation, or being adjacent to material characterised as not being low risk) will be progressively characterised at a similar intensity to the waste rock zone *ie* (nominally) 10 m × 10 m × 5 m (width × length × height). Samples for progressive characterisation will be analysed for NAG and NAPP analytes (*eg* sulfur, acid neutralising capacity and net acid generation test pH) to validate the predicted management type. Progressive characterisation will allow for finer rock management units to be used. This is expected to result in more excavated rock being able to be beneficially reused (*eg* used as quarry material).

⁸ *Pers.comm.* Dean Krak, Geologist, EQR, to John Broughton, Senior Environmental Earth Scientist, NRA, email dated 28 September 2022.

⁹ EQR acquired a 100% interest in Mt Carbine Quarries Pty Ltd, an entity that holds mining leases ML 4867 and ML 4919 and the relevant environmental authorities, in June 2019.

Water Management

A water management strategy for the site, inclusive of a water balance, has been prepared (ATCW 2022a); the following is a summation.

- The water management plan outlines the measures to be implemented to manage water resources.
 - A key objective of stormwater management is to manage clean water. This premise applies to the land areas used for quarry and mining activities, these land areas being shared. The relevant land area 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 19 September 2023 for the mine). The longevity of the quarry resource exceeds that of the mineral resource by multiples; the quarry resource is multi-generational. The clean water diversion structures discussed in the water management strategy (**Appendix 1**) will need to prevail post mining; the EA conditions for the mine and the quarry have relevant compliance requirements of the EA Holder that are addressed in the erosion and sediment control plan (**Appendix 1**) for the land areas used for quarry and mining activities.
 - The key objective for site water management is to minimise catchment areas from which site water is generated, as well as maximising the containment of site water at its source to enable direct reuse.
- The pumping between TSF3, TSF4 and the void detailed in **Appendix 1** is operational information; it is not intended at mine closure. Following cessation of mining, TSF3 and TSF4 will remain as components of the quarry operations, the mineral processing plant-related infrastructure that is located on the area of TSF4 having been removed; rehabilitation milestones and criteria for TSF4 are included in the PRCP Schedule (**Appendix 6**). The AA requires that TSF3, which is authorised in the EA, be identified within the PRCP Schedule and be accompanied by appropriate milestone criteria. The AA considers that transitional rights exist, in that TSF3 is identified as achieving a post-mine land description of ‘industrial’ in the EA; however, the AA’s position is that ‘industrial’ does not relate to retained infrastructure (*ie* a water storage facility), without appropriate alternative approvals (*eg* a Development Approval or a landholder statement)¹⁰. The AA did not accept the information relevant to its position as presented in **Appendix 9**. Under the prevailing circumstances, EQR accepted the AA’s advice¹¹, with milestone criteria included in the PRCP Schedule relating to acceptance of retained infrastructure via a Development Approval as required, and transfer of liability of TSF3 to an amended quarry EA (EPPR00438313) as relevant (**Appendix 6**). Contemporary assessment of the void status at end-of-mine life confirms that, apart from the void itself, serious environmental harm is not expected. The Void Closure Plan is presented in **Appendix 10**.
- Water balance modelling was conducted to assess the performance of the site water management system for the pit expansion.
 - The water mass balance associated with the pit expansion may be managed using site water collected in the two on-site storages.

¹⁰ *Pers. comm.* Marina Gibson, Senior Assessment Officer, AA, to Tim Anderson, Principal Scientist, NRA, email dated 28 August 2024.

¹¹ *Pers. comm.* Tim Anderson, Principal Scientist, NRA, to Marina Gibson, Senior Assessment Officer, AA, email dated 30 August 2024.

- Reinstatement of TSF3, reparation and improvements to TSF4, and use of evaporator sprays contribute to the replacement of water storage capacity due to cessation of the water storage in the open pit.
 - TSF3 will be reinstated in accordance with design specifications (inclusive of consequence category assessment and certification) prepared by a suitably qualified and independent engineer.
 - TSF4 will be improved in accordance with design specifications (inclusive of consequence category assessment and certification) prepared by a suitably qualified and independent engineer.
 - Neither TSF3 nor TSF4 are regulated structures; EQR has commissioned suitably qualified and independent engineers to plan, design and supervise the works.
- The water balance model demonstrated that there will be no spill risk from the open cut pit while it is being dewatered (the open pit has been dewatered and ore extraction recommenced in June 2023). For 2023, the spill risk for TSF3 and TSF 4 is 20% and 23% respectively; and from 2024 to 2027 the spill risk for TSF3 and TSF4 is 2% and 12% respectively.
 - TSF3 spills to TSF4.
 - Spills from TSF4 are via the permitted release point.
- An Emergency and Contingency Plan is in place in the event of uncontrolled spills from any water storage.

1.1.2.3. Cultural heritage

The following information is sourced from the bankable feasibility study for the Project (EQR 2021).

The Mt Carbine mining leases (ML 4867 and ML 4910) are not associated with Native Title, having been granted prior to 1 September 1994; no cultural heritage items have been identified by EQR.

Traditional ownership of the land where the mine is located is recognised as belonging to the Djungan People (People of the Rock). Nguddaboolgan Native Title Aboriginal Corporation (NNTAC) is the prescribed body corporate for the Djungan People. NNTAC holds the native title rights and interests as agent for the Djungan People as determined by the Federal Court of Australia on 2 August 2012. The Djungan People's determined lands span from north of the Walsh River near Dimbulah up through Mount Mulligan and Kondaparinga Station to the Walsh River in the north. EQR pays the required Native Title Administration Fees to NNTAC and maintains regular dialogue and communication on any relevant information pertaining to its activities.

The Reilly family is an Indigenous family with a history in the Mount Carbine area of over 100 years. While not formally recognised as having Native Title, EQR recognises the Reilly family's connection to the area and engages in consultation with the family in relation to current mining and project activities. EQR has employed several Reilly family members in various roles in the operations.

1.1.3 Project description

A description of the quarry and mine has been prepared for context.

The quarry activity under EA EPPR00438313 includes extraction and screening *ie* ERA 16, ERA 2 and ERA 3 (more than 100,000 t/yr but not more than 1,000,000 t/yr) and ancillary

activities. Rock material is extracted from historical waste rock dumps and tailings stockpiles by excavator or loader. No blasting is, or will be, undertaken for the quarry activity. The activities associated with renewed open pit mining, which commenced in June 2023, included blasting and the selective handling and management of excavated rock. The ore bearing (ie tungsten units) component is sorted from rock material by way of XRT-sorter. Subsequently, the tungsten is recovered under the mining EA (EPML00956913) via the gravity beneficiation plant, and is stockpiled according to grade, ready for sale. A schematic representation of the quarry and mining operations is in **Plate 8**.

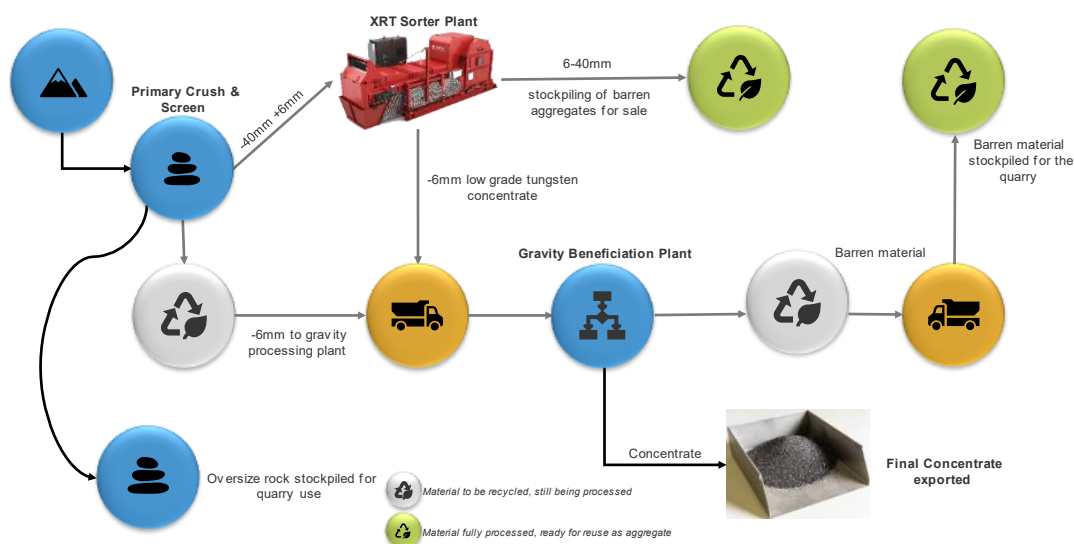


Plate 8: Mt Carbine material flow

The project involves beneficial re-use of waste material from a mining operation. The AA has determined that an End of Waste (EOW) code¹² for the Mt Carbine project¹³ is not required¹⁴. Tungsten units are recovered from (a) existing process residue and hard rock material that is part of the quarry inventory, and (b) *in situ* hard rock material to be won by renewed mining.

Ore has been won through open cut and underground methods. The open cut mine provides access to the existing underground mine workings and resources are intended to be won through renewed underground mine methods in the future¹⁵. Crushing and segregation of tungsten bearing material through the ore sorters occurs ahead of mineral processing through wet gravity separation. The hard rock that is not processed and the residue from processing the tungsten units is returned to the quarry inventory.

¹² The EOW framework under Chapter 8 and Chapter 8A of the *Waste Reduction and Recycling Act* 2011.

¹³ The project involves beneficial re-use of waste material from a mining operation. Tungsten units are recovered from existing process residue and hard rock material that is part of the quarry inventory. The resultant process residue from processing the tungsten units is returned to the quarry inventory.

¹⁴ The decision made by the AA is as follows: 'Based on the information provided, specifically, that the rock, that is not mineral, is extracted during mining activities, and is the material captured under the quarry EA, it is considered that the activity can be undertaken under the Quarrying Extraction EA and an EOW code would not be required' (DES 2020).

¹⁵ Exploration activities continue.

1.1.3.1. Notifiable activities

Notifiable activities are defined in Schedule 3 of the Queensland *Environmental Protection Act* 1994 (EP Act). Lot 13 on Plan SP254833 is included on the Environmental Management Register (EMR)¹⁶ as the site has been subject to the following notifications associated with the mining activity undertaken pursuant to EA EPML00956913: Mine Waste, Mineral Processing, Petroleum Product or Oil Storage¹⁷.

1.1.3.2. Environmentally Relevant Activities

Another key regulatory requirement is the formulation and application of Environmentally Relevant Activities (ERAs) to mining projects, which has evolved from inception to current. **Table 4** lists ERAs undertaken at the project.

Table 4: Existing ERAs for the project site

ERA #	Activity	Threshold
EA EPPR00438313 for the quarry activity		
16	Extractive and Screening	Extraction and Screening 3: Screening, in a year, the following quantity of material (b) more than 100,000t but not more than 1,000,000t.
16	Extractive and Screening	Extraction and Screening 2: Extracting, other than by dredging, in a year, the following quantity of material (b) more than 100,000t but not more than 1,000,000t.
EA EPML00956913 for the mine activity		
14	Electricity Generation	Ancillary 14 – Electricity Generation 2: Generating electricity by using a fuel, other than gas, at a rated capacity of (a) 10MW electrical to 150MW electrical.
8	Chemical Storage	Ancillary 08 – Chemical Storage 4: storing 200t or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d).
15	Fuel Burning	Ancillary 15 – Fuel burning: Using fuel burning equipment that is capable of burning at least 500kg of fuel in an hour.
31	Mineral Processing	Ancillary 31 – Mineral processing 2: Processing, in a year, the following quantities of mineral products, other than coke (b) more than 100,000t.
8	Chemical Storage	Ancillary 08 – Chemical Storage 3: Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c).
8	Chemical Storage	Ancillary 08 – Chemical Storage 5: storing 200 cubic metres or more of chemicals that are liquids, other than chemicals mentioned in items 1 to 3, under subsection (1)(d).
8	Chemical Storage	Ancillary 08 – Chemical Storage 1: Storing a total of 50t or more of chemicals of dangerous goods class 1 or class 2, division 2.3 under subsection (1)(a).
Schedule 3 19	Mining	Schedule 3 19: Mining metal ore, other than a metal ore mentioned in items 11, 12, 14, 15, 16, 17 or 18.

¹⁶ EMR Site ID 139200, as at 26 August 2021.

¹⁷No notifiable activities are planned to occur as part of the quarry activities under EA EPPR00438313.

1.2 Community consultation

This section includes information on stakeholder consultation; the information has been sourced from EQR (2021).

The township of Mt Carbine has a population of about 100 people and a small number of businesses. The mine is centrally located within the township and is proximate to the local businesses. Adjacent to the mine site is a small hotel and caravan park. The nearest significant townships to Mt Carbine are Mount Molloy (30 km), Mossman (65 km) and Mareeba (70 km). Given the size of the township, the workforce and industry support to the mine are largely from surrounding population centres. This will likely continue through the project lifecycle.

There are three businesses within one kilometre of the mine footprint and include:

- Mt Carbine Hotel Motel
- Mt Carbine Roadhouse
- Mt Carbine Caravan Park.

The underlying pastoral leases on which Mt Carbine is located are held by Australian Wildlife Conservancy on a parcel of land known as Brooklyn Wildlife Sanctuary.

Traditional ownership is discussed in **Section 1.1.2.3**.

EQR has considered the sensitive receptors relevant to the project operations (anthropogenic and environmental – spatial information is in **Appendix 7**), with rehabilitation and post-mining land use discussed in **Section 1.3**, and EQR intends to maintain its consultative efforts.

Table 5 lists key stakeholders and potential interests or issues resulting from the project. Given the project's proximity to and the relatively small number of businesses and local stakeholders, communication with local stakeholders has been maintained mostly through informal verbal communications.

Table 5: Stakeholder identification and interests (summary only)

Stakeholder group	Stakeholder name	Interests
Landholders	• Neighbours	• Impact on business operations
	• Crown	• Impact on environment/bird watching
	• Australian Wildlife Conservancy	• Contribution to community
Local residents		• Impact on community and environment
	• Neighbours	• Investment opportunities
	• Residents in community	• Jobs and economic development
		• Noise dust and vibration
		• Impact to way of life
Traditional Owners	• Nguddaboolgan Native Title Aboriginal Corporation	• Impact on community and environment
	• Reilly Family	• Investment opportunities
		• Jobs and economic development
Internal stakeholders	• Board	• Investment opportunities
	• EQ leadership	• Jobs and economic development
	• Employees and contractors	• Impact on community and environment
Local businesses	• Mt Carbine Caravan Park	• Impact on business operations
	• Mt Carbine Roadhouse	• Impact on environment/bird watching
	• Mt Carbine Hotel Motel	

Stakeholder group	Stakeholder name	Interests
	• Bustard Downs Accommodation and camping organic farm • Other mining/resources proponents in the region	• Business opportunities -supplies, • accommodation
Industry bodies, business groups, peak bodies	• Critical Minerals Office • Association of Mining and Exploration Companies • AusiMM • Queensland Resource Council (QRC) • Mareeba Chamber of Commerce • Unions	• New resource opportunities-critical metals • Investment • Environmental impacts managed • Impact on employees, creation of jobs
Government	• Elected representatives • Federal Member for Kennedy • Premier of Queensland • State Member for Cook • Mayor – Mareeba Shire Council • Councillors	• Meets regulatory requirements • Economic development, investment, jobs and business opportunities • Contribution to community
Government departments and agencies ¹	• Department of Environment and Science • Department of Natural Resources and Mines • Department of Agriculture and Fisheries • Department of Transport and Main Roads • Department of Aboriginal and Torres Strait Islander and Multicultural Affairs • Department of Employment, Education and Training • Department of Health • Cairns and Hinterland Hospital and Health Service • Emergency services – police, ambulance, rural fire	• Impacts on government assets or programs • Meets regulatory requirements • Economic development, investment, jobs and business opportunities • Contribution to community
Local government	• Mareeba Shire Council • Chief Executive Officer • Director Infrastructure • Director Corporate and Community Services	• Meets regulatory requirements • Economic development, investment, jobs and business opportunities • Contribution to community
Community, special interest groups	• Bird watchers	• Community, special interest groups
Media	• TV, newspapers, radio, social media	• Community stories

¹ Administrative arrangements and names may vary when a change in the structure of government—known as ‘machinery of government’—takes place.

EQR has completed the following.

Stakeholder identification and analysis

A desktop review of potentially impacted stakeholders and identification of opportunities and constraints for the project has been completed. Stakeholder identification and analysis will be ongoing throughout the project. The database will regularly be reviewed and updated throughout the project as new information, issues or options are identified.

Community and Stakeholder Engagement Plan (CSEP)

A high-level CSEP was developed by EQR early in the project to ensure key stakeholders become involved and invested early in the project, therefore helping to endow stakeholders with a sense of ownership over the finished product. This also helps to identify potential risks to the project and therefore, come up with mitigation measures. The CSEP is adaptive, as the technical elements of the project will likely change the scope of the consultation and engagement. This approach will allow flexibility and give the opportunity for more detailed and innovative consultation to be completed at appropriate times.

Consultation Register

A stakeholder register has been developed by EQR and will track all communication and interactions. This is a living document that will track engagement activities. The register is used for reporting, tracking emerging trends or an escalation of potential issues/opportunities.

EQR maintains a Consultation Register to record, monitor and report on interactions with all stakeholder, community and service providers. The register:

- records community and stakeholder contact information
- records letterbox drops, project updates, notifications and interactions
- records and manages complaints, enquiries, issues and responses
- records key personnel and interactions from government agencies and service/utility providers
- is used to identify issues and opportunities.

Implementation

Although many stakeholder groups have been identified, the level of engagement required for each group varies significant. Additionally, the activities are likely to change during the project life. As the facility is operational, the focus is on communication and responding to enquiries and complaints.

DES requires the inclusion of a *community consultation register* (detailing consultation already undertaken) and a *community consultation plan* (outlining future commitments to consult regarding rehabilitation outcomes); the following tabulated register (**Table 6**) and plan (**Table 7**) have been prepared by EQR.

Table 6: Community Consultation Register¹

Consultation date	Community member	Consultation type	Information provided	Issues raised by community	How issues were considered	Decisions/outcomes	Commitments
22/03/2022	Mareeba Shire Council	Execution of Compensation Agreement	Compensation Agreement between Mareeba Shire Council and Mt Carbine Quarries Pty Ltd (MCQ) regarding Mining Lease No. 4867 in the Mareeba Mining District, and/or any surface access to the land	Nil	N/A	Compensation Agreement Executed on 10 March 2022 until the term of the mine life	As per the Agreement.
18/05/2022	AusIMM Tour FNQ Branch – Geraldine McGuire (Chair) and 12 additional attendees	Site tour	General arrangement Future plans Circular economy approach	Nil	N/A	N/A	EQ CEO and Management Team make time to host visitors interested in the Mt Carbine Operations.
22/06/2022	Mitchell River Watershed Management Group	Sponsorship	Sponsorship of Frogbit Sentinel Network	Nil	N/A	N/A	Sponsorship and involvement with the Mitchell River Watershed Management Group to support management of invasive species by the Frogbit Sentinel Network.
7/09/2022	Scott Stewart – Minister for Resources	Site tour	General arrangement Future plans Circular economy approach	Nil	N/A	N/A	EQ CEO and Management Team make time to host visitors interested in the Mt Carbine Operations.
2/11/2022	Patrick (Pat) Weir – Shadow Minister for Natural Resources, Mines and Energy	Site tour	General arrangement Future plans Circular economy approach	Nil	N/A	N/A	EQ CEO and Management Team make time to host visitors interested in the Mt Carbine Operations.
11/11/2022	Australian Wildlife Conservancy (AWC)	Execution of Compensation Agreement	Compensation Agreement between AWC and MCQ regarding Mining Lease No. 4867 and Mining Lease No. 4919 including access to those mining leases	Nil	N/A	Compensation Agreement Executed on 11 November 2022 for the term of the tenement.	EQR has signed a 20 year commercial Agreement with AWC and has agreed to co-operate in several areas relating to Brooklyn Wildlife Sanctuary. Ecological well-being initiatives will also support social aspects through job provision in the conservancy area. Members of EQR’s management team will engage with AWC on a monthly basis to discuss weed control and land management.
14/11/2022	Critical Minerals Accelerator Initiative (CMAI) Department of Industry, Science, Energy and Resources (Onshore Minerals) Gulf Savannah NRM	Site tour	General arrangement. Future plans. Circular economy approach	Nil	N/A	N/A	EQ CEO and Management Team make time to host visitors interested in the Mt Carbine Operations.
24/11/2022	<i>We’re a non-profit company and a registered charity, working with people and communities to create opportunities for current and future generations in the Gulf region. Our projects help strengthen communities and industries. We cultivate living landscapes to support local livelihoods.</i> <i>The Gulf Savannah NRM team works from offices in Georgetown, Croydon and Mareeba, connecting science, technology and Landcare to improve productivity for farmers and graziers. We balance social, economic and cultural interests and maintain environmental values and healthy ecosystems.</i>	Presentation	A presentation by Kevin MacNeill regarding EQR circular economy approach to mitigate waste in mining and mine restart activities	Nil	N/A	N/A	Remain committed to supporting local groups, not-for-profit organisations and the community at large.

Consultation date	Community member	Consultation type	Information provided	Issues raised by community	How issues were considered	Decisions/outcomes	Commitments
	<i>Our projects include regenerative farming, healthy soils, Indigenous partnerships, new technologies for agriculture, grazing business resilience, environmental education, and advocacy for better telecommunications for the region.</i>						
1/12/2022	Mt Carbine residents Local media	Community consultation (information evening)	Mt Carbine Project information evening – mine restart consultation	What will happen after life of mine	Two-way conversation and explanation of the circular economy approach EQR takes in stockpiling material for quarrying use by the surrounding region.	Community is very supportive of the expansion of the mine and EQR. Praised circular economy approach and see the value the quarry has to offer the community.	Continue to update on developments via social media and email notifications.
8/12/2022	Association of Mining and Exploration Companies (AMEC) Award Ceremony	Award Gala – winner of AMEC Environment Award	-	-	-	The AMEC Environment Award was presented to EQR for supporting the transition to a low carbon future and their commitment towards sustainable development of natural resources at their Mt Carbine Tungsten mine. <i>It was clear from their submission that EQ Resources is developing innovative methods to achieve better long-term environmental outcomes.</i>	Continue with our circular economy approach. Invest in research and innovation that reduces waste in mining.
12/12/2022	EQR employees (primarily local workforce) Mt Carbine residents	Community consultation (informal) end of year BBQ	Informal discussion of mine plans for restart and future	Nil	No issues were raised and residents expressed that due to the fact Mt Carbine is an historic mine and the pit has been part of the landscape for many years, they are well accustomed to the mine and its surrounding landscape.	N/A	Continue to have an open-door policy with residents where they can engage with management both formally and informally as they see fit.
3/03/2023	Institute of Quarrying FNQ Committee – Queensland Sector (24 attendees) as arranged by Natalie Scott (Events and Engagement Coordinator)	Site tour for members	General arrangement. Future plans. Circular economy approach.	Nil	N/A	N/A	EQ CEO and Management Team make time to host visitors interested in the Mt Carbine Operations.
1/06/2023	Sarah Gooley – QLD Director, Association of Mining and Exploration Companies (AMEC)	Site tour	General arrangement. Future plans. Circular economy approach.	Nil	N/A	N/A	EQ CEO and Management Team make time to host visitors interested in the Mt Carbine Operations.
9/06/2023	Brooklyn Village Estate – Chair and Secretary	Meeting to discuss the objectives of the Estate, how EQR can contribute Sponsorship opportunities	Brooklyn Village Estate Blueprint	No issues were raised and EQR was identified as a major sponsor to the Brooklyn Village Estate.	EQR considered the objectives of the Estate and formally agreed to rectify power in the Recreational Hall. This will be an ongoing activity as new objectives are identified by the estate and residents.	N/A	Remain committed to supporting local groups, not-for-profit organisations and the community at large.

Consultation date	Community member	Consultation type	Information provided	Issues raised by community	How issues were considered	Decisions/outcomes	Commitments
19/06/2023	Hayden Kilpatrick Craig Stevenson Mt Carbine Roadhouse (Bruce and Janine Metzger) Ian and Irene Boyd Owen Mills Mt Carbine Hotel (Dale and Jane) Phil and Joyce Robins Karen Fobister Julie (On Country Representative) Mt Carbine Caravan Park (Nicki Robertson and Darryl Anderson) (Blast notification distribution list)	Informal meeting – face to face	Formal notification of blasting activity, delivered in person where possible Invitation to participate in community consultation evening	Nil	N/A	N/A	To formally notify residents of blasting activity.
22/06/2023	Mt Carbine residents	Community consultation (BBQ) Blasting activity (ongoing)	Presentation – Darry Anderson (Community) Presentation – Kevin MacNeill (EQR) regarding Executed Mining Service Agreement with Golding Contractors Pty Ltd and official restart of open pit operations Presentation – Steven Page (Golding) regarding blasting activity, noise and vibration and reiteration that all lines of communication are open to the community should they require any information or have any concerns or queries once blasting commences.	Nil	N/A	Community is very supportive of the expansion of the mine and EQR – no issues to report	Email distribution list established to ensure residents are notified prior to each scheduled blast.
1/08/2023	QEC Tech Summit	Panel discussion	ESG panel discussion EQR production update Announcement of acquisitions	Nil	N/A	N/A	To continue to ensure EQR team are available to share their knowledge and experience.
7/08/2023	Local radio (Douglas Radio – hosted by Marion Makin)	Media	Project update and general overview	Nil	N/A	Nil	To continue to use local media along with social media to connect with and update our community on current and planned undertakings.
12/08/2023	EQR Employees (primarily local workforce)	Sponsorship	Informal meet and greet opportunity regarding sponsorship of Mt Carbine Annual Bull and Bronc Ride	Nil	N/A	EQR has financially supported the Mt Carbine Annual Bull & Bronc Ride since 2021. It is an informal opportunity for employees (primarily local workforce) and residents of both Mt Carbine and surrounds to enquire about the project and express any concerns. All feedback to date has been only positive.	Ongoing sponsorship of Mt Carbine Bull and Bronc Ride.
23/08/2023	Department of Tourism, Innovation & Sport	Letter of support	In-kind sponsorship and letter of support – Advance Queensland Industry Research Fellowship Application	Nil	N/A	EQR will continue to support individuals (sponsorship) and groups (speaking engagements) that support the transition to a more circular economy for mining waste in Queensland.	In-kind sponsorship.

Source: EQR.

Table 7: Community Consultation Plan¹

Objective	Engagement type	Proposed consultation frequency	Released information	How feedback/comments are considered
Manage weeds and invasive species within and around the Mining Lease.	Via telephone, e-mail and in person	Monthly engagement	In line with the Australian Wildlife Conservancy (AWC) Compensation Agreement (Executed November 2022) EQR management team maintains a close working relationship with AWC to ensure both parties meet contractual obligations. Part of this agreement includes: • feral animal control • annual Ecohealth monitoring (lowland ecosystems) • 3–4 weeks of standard fauna surveys • assessment of operational fire program and impact on habitat for identified fauna • establishing a vegetation monitoring program, including mapping <i>Callitris</i>.	We work in conjunction with AWC and maintain a close working relationship. We take on board their requests, to date being to notify them when we are entering the Brooklyn Wildlife Sanctuary (for sampling) and that all entry points from the highway are left covered so as not to encourage entry by the public. We ensure we notify AWC when we plan to enter Brooklyn Wildlife Sanctuary. We ensure entry points remain covered. We consider any recommendations they provide and discuss and execute as agreed.
Work in consultation with AWC regarding land management, particularly controlled burning activities.	Via telephone, e-mail and in person	Monthly engagement	As above, EQ works in conjunction with AWC to undertake planned and controlled burning activities to mitigate fire risk.	We work in conjunction with AWC and maintain a close working relationship. A program of burning-off activity is agreed between EQR and AWC prior to commencement of activities generally scheduled for February of each year (following the wet season).
Engage with the community regarding the restart of mining operations and continue to update community regarding post mining land use. EQR will engage with the community both formally and informally so that we can understand and respond to their interests and concerns. We will have authentic conversations with community members clearly outlining what can and cannot be influenced and provide feedback to the community on how input has been taken into consideration.	Face to face Organised events Sponsored events Site visits/tours Open-door policy to residents of Mt Carbine	As and when engagement takes place (informal) Annually as a minimum (formal) via planned community consultation events	Initially EQR organised a Community BBQ and engaged in a two-way conversation with community members that included an explanation of the circular economy approach EQR takes in stockpiling material for quarrying use by the surrounding region. Moving forward these events will be held annually as a minimum to obtain feedback on final land use design.	Community is very supportive of the expansion of the mine and EQR. Community members appreciate EQR’s circular economy approach to minimise mining waste and see the value the quarry has to offer the community for future generations. Approach is always a two-way conversation and open-door policy to residents.
Notify all residents in person of upcoming blasting activity and invite them to planned community consultation evenings throughout the life of the project to ensure they remain informed of scheduled activity. Respond to any questions regarding blasting activity and consider feedback to minimise any negative affects blasting activity has on community members.	Face to face (or letter) Face to face (organised events)	Annually as a minimum (formal) via planned community consultation events	Notification of Blasting Activity (Letter) Map of Blast Zone (Letter) Welcome – Darryl Anderson (Community representative/owner, Mt Carbine Caravan Park) Introduction and Mine Update – Kevin MacNeill (CEO, EQR) Detail of Activity (Blasting) – Steven Page (PM, Golding Contractors Pty Ltd) Questions/comments/feedback – community members	Initial feedback included residents wanting to understand the blasting schedule. Residents were notified that: • we anticipated blasting would occur weekly • noise and vibration would be monitored • they would be notified in advance prior to any scheduled blasting activity. Residents were happy to receive notifications via e-mail. Distribution list was established, and notifications are sent prior to each scheduled blast. We have also installed a Blasting Notice board which is updated at least 24 hours prior to blasting activity and is visible from the Mulligan Highway. Overall, no further questions/issues were raised, and residents expressed that due to the fact Mt Carbine is an historic mine and the pit has been part of the landscape for many years, they are well accustomed to the mine and its surrounding landscape.
Continually review and improve circular economy approach by investing in research and innovation in the field of reducing waste in mining and associated risk management. Remain committed to sustainably producing and managing new economy minerals and metals and minimising our footprint where possible.	Academic sponsorship events	Where available	Ongoing webinars, panel discussions and sponsorship of academic research	Feedback is welcomed and appreciated. No issues have been presented to date. The objective is to continue to improve on our circular economy approach and minimise waste in mining.

Source: EQR.

1.3 Post-mining land use

This section includes the assessment of post-mining land use (PMLU) options, methodology for determining PMLU options, and details of each nominated PMLU. The historical context *ie* land-use-associated statutory mechanisms and approvals of the project and post-mine condition is also relevant (**Appendix 9**).

The EA provides detailed specifications of PMLU for disturbed areas. The PMLU for land disturbances are listed in Schedule C – Table C1 of the EA; summation of the mine domains, mine feature name, post-mining land use descriptor and the rehabilitation objective is presented in **Table 8**. This information informs the PRCP *ie* the rehabilitation planning part and the schedule.

Table 8: Post-mining Land Use

Mine domain	Mine feature	Post-mining land use description	Rehabilitation goal
Residual void	Open pit	Residual void	a) Does not cause environmental harm other than harm constituted by the existence of the void itself b) Geo-technically and geochemically stable with no subsidence or erosion gullies for at least 3 years and; c) Safe to humans and wildlife
	Noise bund	Safety bund surrounding residual void	
Infrastructure	Roads and pipelines		a) Non-polluting; b) Geo-technically and geochemically stable with no subsidence or erosion gullies for at least 3 years; c) Established groundcover to ensure erosion is minimised; d) Established vegetation of floristic species composition found in analogue sites and which are not weed species; e) Maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the mining activity(ies); and f) Is safe to humans and wildlife.
	Old mine workings, old stockpile area, sulfide disposal dump region (excluding historical sulfide disposal dump), core yard and laydown area, office & laboratory, laydown near processing plant, processing plant and workshop, previous mill and ROM	Low Intensity Grazing	
	Overburden dump piles	Historical sulfide disposal dump	
	Exploration	Exploration bore holes	
	Tailings storage facility	TSF4	
		TSF3	Industrial
Ancillary mining disturbance	Mulligan Highway intersecting ML4867 and ML4919	Highway and associated culverts to remain with the appropriate administering authority	N/A

1.4 Non-use management areas

Land disturbance types that will remain as non-use management areas (NUMA) after mine closure are the open pit and its bund (*ie* the noise bund forms part of the safety bund at closure). The relevant land outcome document (LOD) is the EA. The open pit will provide access to the underground mine workings, subject to renewal of underground mine methods; upon cessation of all mining, the open pit will be a residual void that is bunded. With the existence of the LOD, exemptions apply to the Queensland *Environmental Protection Regulation* 2019, Section 213 and Schedule 8A, Part 3, Table 1 and Table 3 (with respect to the objective assessment to be undertaken for the PRCP), and to EP Act Section 126 C(1)(g–h) and 126 D(2–3). Regarding the requirements of Section 126 C(1)(d) of the EP Act:

- **Section 1.2** describes the previous and proposed consultative actions
- the historical context *ie* land use, associated statutory mechanisms and approvals of the project and post-mine condition is also relevant (**Appendix 9**)
- the project is within the Mareeba Shire, and the ongoing use of the land that forms the project area for extractive industry purposes is an existing right of use (the open cut is on the figure attached to the information provided by the local government authority) (**Appendix 9**).

In conclusion, the ‘open pit and its bund’ NUMA proposed in this PRCP is the same as that in the EA, is consistent with historical documentation and consistent with the local government plan. These disturbance areas (*ie* ‘open pit and its bund’ NUMA) have been included within this PRCP as improvement areas that are subject to management milestones.

1.4.1 Voids in flood plains

No voids in flood plains will be present at mine closure.

Flooding of the open pit is not considered a significant risk.

- Manganese Creek is the closest watercourse to the open pit.
- The lip of the open pit is some 10 m higher than, and 300 m away from, the channel of Manganese Creek.
- To flood the open pit, Manganese Creek would need to flood the valley up to the height of the open pit *ie* approximately 10 m above the bed of Manganese Creek.
- The cross-section area of the 10 m deep flooded valley is 3,000 m² (10 m × 300 m).
- Conservatively assuming the water in the valley has a speed of 1 m/s (*ie* slow), the flow in Manganese Creek would be 3,000 m³/s.
- Measured flows in Manganese Creek (NRA 2024c), including those associated with the record rainfall from Cyclone Jasper, reported a maximum flow of 19 m³/sec (on 20 December 2023).
- Approximately 150 times the measured flow in Manganese Creek during record rainfall would be required to flood the open pit.

1.5 Rehabilitation management methodology

This section includes information describing how the proposed rehabilitation management methodology has been developed and will be implemented.

As land areas become available post-mine activities, rehabilitation commences subject to utilisation by the quarry operations.

The rehabilitation areas (RAs) nominated in the PRCP Schedule have been defined considering the relevant land outcomes (as defined in the EA), disturbance types and rehabilitation methods. The time periods (*date area is available, milestone completed by*) have been determined in consideration of:

1. the requirement for progressive rehabilitation
2. mine planning
3. quarry planning
4. the period required to achieve successful rehabilitation for different disturbance types.

The *rehabilitation milestones* and *rehabilitation criteria* are site-specific and have been derived following consideration of the *Rehabilitation objectives* (PMLU and *Rehabilitation goal* defined in the EA).

1.5.1 General rehabilitation practices

Rehabilitation will be undertaken in accordance with the conditions of the EA; the approach described previously (NRA 2013) applies, as summarised below, with a change being that the quarry activities are beneficially re-using a mining waste product.

Upon completion of activities, the plant and equipment will be removed for sale. Demountable buildings, piping and cabling will be removed and disposed of off-site. Concrete from the building footings will be disposed of on-site (consistent with EA EPML00956913). Relevant areas will be surveyed for contaminated land; this will include soil testing and remediation (if required). The areas will be ripped and re-profiled. A surface layer for plant propagation will be prepared, which will then be revegetated. If surface soil is available, it will be used.

Rehabilitation of the areas disturbed by the operations will reflect the surrounding land use (*ie* low intensity grazing) to achieve the nominated PMLU in the EA. Revegetated areas will be maintained (monitoring, weed control, and replenishment treatment) until the success criteria demonstrates that rehabilitation is on a trajectory to achievement of the nominated performance outcomes.

1.5.2 Rehabilitation approach

The proposed rehabilitation approach for each disturbance area is described in the following sections. The overarching rehabilitation approach is as follows.

- Re-use of resources on-site for extraction of tungsten ore from waste or reject stockpiles and tailings.
- Re-use of resource materials on-site for road base or other beneficial uses (*ie* quarry inventory) subject to appropriate characterisation.
- Progressive rehabilitation of areas as the resource use is completed and the PMLU is realised by the process.

1.5.3 Rehabilitation methods

The general components of site rehabilitation are:

- demolition and removal
- land contamination clearance
- re-profiling of the landscape to be rehabilitated
- resspreading surface material
- re-establishment of vegetation

- management during establishment
- scheduling.

Infrastructure removal and land contamination

Any infrastructure that is not retained needs to be removed and the land included in rehabilitation.

Land contamination assessments of areas with suspected contamination are to be undertaken by an appropriately qualified person and in accordance with the EP Act.

A contaminated land assessment will be completed on relevant infrastructure areas where required. This includes all areas where notifiable activities were undertaken to ensure unacceptable levels of contaminants are not present prior to undertaking rehabilitation. The assessment will include a preliminary site investigation to identify if any areas require further detailed site investigation. The investigation(s) will be prepared and certified by an appropriately qualified person. Where the preliminary site investigation identifies a requirement for further investigation, a targeted detailed site investigation will be undertaken to confirm and characterise areas of concern. If contamination is identified, the potential risks will be assessed and, where required, remediation will be undertaken and/or a site management plan developed.

Re-profiling

All mine areas will have specific requirements regarding their final landform and specifically drainage. All engineering, re-contouring and ripping works will be undertaken prior to the final re-establishment of vegetation.

Soil material

Material on-site will be investigated to determine if it is suitable as a growth medium. It is likely that large areas will be revegetated directly into the substrate material.

Re-establishing vegetation

An assessment of the agronomic suitability of available growing media will be undertaken prior to use, and ripping and fertiliser specifications will be determined. For the majority of the site, it is envisaged that a generic fertiliser regime can be applied. This will comprise a low phosphate fertiliser *eg* GrowForce 450 which has an NPK ratio of approximately 13.1:1.7:13.9. The nominal application rate is 250 kg per hectare.

Re-establishment of vegetation will comprise direct seeding with seed sourced preferably from the Mt Carbine region. Where seeds of local provenance are not available, seed will be sourced from a Queensland native seed supplier.

Areas to be direct seeded (and rolled) will be prepared for seeding prior to the wet season. This may include ripping and/or scarifying the ground (to increase seed capture and soil seed contact; maximum depth likely to be achieved is 100–200 mm; carried out after early wet season rain and immediately prior to direct seeding). The decision to rip or not will be made based on the area's previous use and a visual assessment of the soil surface.

There is some flexibility in the selection of species; however, the emphasis should be on using native species that occur locally and form natural components of woodlands and regrowth vegetation in the region. Seed should be of local provenance and therefore a specific seed collecting program is required prior to revegetation works. It is likely to be more efficient to use a limited number of introduced species such as sterile forms of Japanese Millet (*Echinochloa esculenta*) to establish a soil binding cover and organic matter in a relatively short time.

The quantity of seed to be spread per hectare is dependent on the target community, seed viability and cost. As a rule of thumb, a typical seed mix will comprise:

- 20-40 kg/ha of cover crop (commercially available hybrid pasture species)
- 10 kg/ha of native grass seed
- 2-5 kg/ha of native tree/shrub seed.

Revegetation should be composed of any combination from the following list of native plant species: *Acacia disparrima* subsp. *calidestris*, *Acacia flavescens*, *Acacia holosericea*, *Acacia simsii*, *Acacia victoriae*, *Alphitonia excelsa*, *Bothriochloa bladhii*, *Breynia oblongifolia*, *Carissa ovata*, *Clerodendrum floribundum*, *Corymbia clarksoniana*, *Corymbia dallachiana*, *Corymbia erythrophloia*, *Corymbia tessellaris*, *Crotalaria medicaginea*, *Croton minimus*, *Denhamia bilocularis*, *Eragrostis elongata*, *Erythrina vespertilio*, *Eucalyptus leptophleba*, *Eucalyptus platyphylla*, *Grewia latifolia*, *Grewia savannicola*, *Heteropogon contortus*, *Indigofera pratensis*, *Larsenaikia ochreatea*, *Melaleuca quinquenervia*, *Melaleuca stenostachya*, *Melaleuca viridiflora*, *Pandorea pandorana*, *Panicum decompositum*, *Petalostigma pubescens*, *Rhynchosia minima*, *Terminalia subacroptera*, *Themeda triandra*, *Vachellia bidwillii*.

Establishment

Seeding will take place with the early wet season rains. If initial seeding fails, follow-up seeding will be carried out up to the start of March.

Weed control will be carried out 4–6 weeks after seeding and once again at the end of the wet season. This timing may vary depending on the success of seeding.

Fire should be excluded from revegetation sites until vegetation is self-regenerating (flowering and fruiting) and able to contribute seed to the soil seed bank.

Maintenance

Revegetated areas will be maintained (monitoring, weed control and replenishment treatment) until the success criteria which demonstrate that rehabilitation is on a trajectory to achievement of the nominated target community are met.

Scheduling

Successful implementation of the rehabilitation program will depend on integrating the rehabilitation works into the mine program. There are recurring milestones which can be used to assist planning and to monitor progress and these are as follows:

- annual rehabilitation planning and budgeting
- resourcing (ordering of materials)
- recontouring
- annual seeding with wet season
- rehabilitation establishment and maintenance
- rehabilitation monitoring
- retreatment
- seed collection throughout the year.

1.5.4 Tailings storage facilities

The project site has facilities from historical operations that in that historical context were for the purpose of storing process residues. Of these facilities, the site for the disposal of process

residues that contained elevated sulfides, referred to as the ‘historical sulfide disposal dump’, (0.3 ha) has served nil purpose for *ca* 40 years, has no discernible surface footprint *ie* it was backfilled and covered *ca* 40 years ago, and apart from being a rehabilitation legacy has no relevance to the current operations. The other two facilities *ie* TSF3 and TSF4 were facilities that retained process residues from the previous operations *ca* 40 plus years ago. The residues in TSF3 were excavated for use in the quarry operations (NRA 2013, QT 1994, QT 1992). The residues in TSF4 are quarry inventory. TSF3 and TSF4 are repurposed, and made fit-for purpose and improved respectively, for the contemporary operations. Following cessation of mining, TSF3 and TSF4 will remain as components of the quarry operations, the mineral processing plant-related infrastructure that is located on the area of TSF4 having been removed; rehabilitation milestones and criteria for TSF4 are included in the PRCP Schedule (**Appendix 6**).

The AA requires that TSF3, which is authorised in the EA, be identified within the PRCP Schedule and be accompanied by appropriate milestone criteria. The AA considers that transitional rights exist, in that TSF3 is identified as achieving a post-mine land description of ‘industrial’ in the EA; however, the AA’s position is that ‘industrial’ does not relate to retained infrastructure (*ie* a water storage facility), without appropriate alternative approvals (*eg* a Development Approval or a landholder statement)¹⁸. The AA did not accept the information relevant to its position as presented in **Appendix 9**. Under the prevailing circumstances, EQR accepted the AA’s advice¹⁹, with milestone criteria included in the PRCP Schedule relating to acceptance of retained infrastructure via a Development Approval, and transfer of liability of TSF3 to an amended quarry EA (EPPR00438313) (**Appendix 6**).

1.5.5 Voids

The open pit will provide access to the underground mine workings, subject to renewal of underground mine methods; upon cessation of all mining, the open pit will remain as a residual void.

Contemporary assessment of the void status at end-of-mine life confirms that, apart from the void itself, serious environmental harm is not expected.

The Void Closure Plan is presented in **Appendix 10**.

Water quality

The quality of water in the void measured up to early 2023, that includes an extended period of mine closure, is indicative of the water quality that can be expected in the future (refer to **Appendix 3**).

Spill risk

It is not expected that the void will overtop following mine closure under current climatic conditions nor projected climate change scenarios (refer to **Appendix 4**).

Sink

It is expected that the void will be a groundwater sink (refer to **Appendices 2 and 3**).

¹⁸ *Pers. comm.* Marina Gibson, Senior Assessment Officer, AA, to Tim Anderson, Principal Scientist, NRA, email dated 28 August 2024.

¹⁹ *Pers. comm.* Tim Anderson, Principal Scientist, NRA, to Marina Gibson, Senior Assessment Officer, AA, email dated 30 August 2024.

1.5.6 Underground mining

Hard rock has been won through open cut and underground methods. The open cut mine provides access to the existing underground mine workings, and ore is intended to be won through renewed underground mine methods in the future. Hard rock extracted from the open pit that is not suitable for tungsten recovery nor for inclusion in the quarry inventory will be stored in an appropriately designed waste rock dump. This hard rock is intended to be disposed of in the open pit and/or in the underground mine. Similarly, hard rock from underground mining that is not suitable for tungsten recovery nor for inclusion in the quarry inventory is intended to be disposed of in the underground.

The following draws from information on underground mining at Mount Carbine presented in the Void Closure Plan (**Appendix 10**).

Historical underground mining at Mount Carbine has occurred in two phases.

- Historical artisanal workings.
 - Artisanal workings where small-scale mining occurred down to 60 m depth using hand mining methods. Drives were 1.5 × 2.0 m generally and rabbit holed the high-grade veins. None of these workings were outside the pit completed in 1986.
- Decline constructed in 1987–1988.
 - A decline was started in 1987 when open cut mining was completed. A full underground mine was designed, and feasibility completed. By 1988, 430 m of the decline had been developed before the project went on hold.

Renewal of underground mining is planned to follow a modified Avoca method (**Appendix 10**), subject to the outcomes of exploration work (current) and feasibility studies that include, among other matters, a hydrogeological assessment and risk assessment. As is the case with the historical underground mining at Mount Carbine, subsidence related impacts to the land surface due to renewed underground mining is not likely (**Appendix 10**). Hard rock from underground mining that is not suitable for tungsten recovery or for inclusion in the quarry inventory is intended to be disposed of underground. The materials characterisation method and materials handling decision rules developed for the project and described in detail in **Section 1.1.2.2** have application. Upon cessation of mining, underground entries (*ie* portals, vents, emergency egress) will be decommissioned and sealed consistent with contemporary method (refer to QLD 2024).

1.5.7 Built infrastructure

Infrastructure that is not retained is included in rehabilitation, *ie* decommissioned, demolished, salvaged and/or disposed of, with the remaining land rehabilitated to the agreed PMLU.

1.6 Risk assessment

This section identifies the risk of a stable condition for land not being achieved and a risk treatment plan outlining how the applicant will manage or minimise the risk.

Environmental Programs (EPs) have been developed to address the major activities undertaken. The EPs link environmental objectives and controls required to meet compliance obligations and formally allocate environmental responsibilities to employees. The potential hazards, their risk levels, and their associated mitigation controls are identified in the project

Risk Assessment Register (RAR)²⁰ (**Appendix 5**). The RAR accords with AS ISO 31000:2018 *Risk Management – Guidelines*. Section 126C(1)(f) and (j) of the EP Act, requires that the rehabilitation planning part of the PRCP:

- identify the risks of a stable condition for land described as a post-mining land use not being achieved, and how the risk will be managed or minimised
- identify the risks of the NUMA causing environmental harm and not being safe and structurally stable, and detail how the risk will be managed and minimised.

The risk assessment for the above items using the method for the RAR, incorporating the risk treatment plan and presented in **Table 9**, supports the milestone criteria in the PRCP Schedule (**Appendix 6**). The majority of rehabilitation areas had a ‘low’ overall risk rating for failure to achieve rehabilitation milestones. The exception was the failure to achieve the rehabilitation milestone for the void and its bund, for which the potential of a fatality applies, which, in this assessment, is a critical consequence resulting in an overall risk rating of ‘high’. No further risk treatment measures are proposed.

²⁰ The RAR is a live document. The environmental risks associated with rehabilitation are reviewed periodically or as risks associated with rehabilitation are identified.

Table 9: Risk Assessment – PRCP



Rehabilitation Milestones	Risk	Cause	Impact	Controls	Score			Responsibility	Resources	Performance measures	Monitoring Reporting	Timing Scheduling
					Consequence	Likelihood	Rating					
RM1	The buried historical sulfidic waste material (0.3 ha) contributes to unacceptable environmental harm. The disturbance type has served nil purpose for ca 40 years, has no discernible surface footprint ie it was backfilled and covered ca 40 years ago.	Exposure of the historical sulfidic waste material giving rise to accelerated mobilisation of contaminants.	Assimilative capacity of the receiving environment exceeded.	The area of the historical sulfidic waste material will be further covered adopting the State's 'High Risk' cover.	Low	Unlikely	Low	Rehabilitation contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	Inspection Test Plans (ITPs) completed for each layer of the cover sequence	"as built" construction plans certified by an Appropriately Qualified Person (AQP).	Commence 2033 (initiate at end of open cut mining, nominally 10 years for open cut which started 2023)
RM2	Infrastructure removal is incomplete	Built infrastructure that is not required for ongoing beneficial use, including building materials, services, slabs and footings, is left onsite.	Creation of derelict materials that contribute to visual pollution and present a hazard to native fauna, stock and humans.	Removal of built infrastructure that is not required for ongoing beneficial use, including building materials, services, slabs and footings.	Low	Unlikely	Low	Appropriately qualified and certified Contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	Redundant infrastructure removed	AQP certification report	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)
RM3	Site is not appropriately decommissioned	The decommissioning tasks are not appropriately completed	Retention of legacy features that give rise to accelerated mobilisation of contaminants that are beyond the assimilative capacity of the receiving environment, contribute to visual pollution and present a hazard to native fauna, stock and humans.	Site investigation report and as relevant a site management plan prepared	Low	Unlikely	Low	Appropriately qualified and certified Contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	Certified site investigation report and as relevant site management plan	AQP certification report	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)
RM4	Inappropriate landform	The decommissioning tasks are not appropriately completed	Features that give rise to accelerated mobilisation of contaminants that are beyond the assimilative capacity of the receiving environment	All major earthworks completed in accordance with as constructed survey plan showing surveyed area contours, finished slope and conformance to designed landform and drainage.	Low	Unlikely	Low	Appropriately qualified and certified Contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	Certified site investigation report and as relevant site management plan	AQP certification report	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)
RM5	Surface preparation is not fit for purpose	Vegetation establishment and growth medium not fit for purpose.	The reliability of the revegetation component of rehabilitation is reduced; the likelihood of additional resources for revegetation and rehabilitation increases.	Apply the knowledge from rehabilitation trials and adopt appropriate 'seed bed' preparation.	Low	Possible	Low	Rehabilitation contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	ITPs completed for surface preparation	AQP certification report	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)
RM6	Revegetation failure	Vegetation failure due to inappropriate growing media, inappropriate propagation material, pathogens or the like, herbivores, and/or weather.	The reliability of the revegetation component of rehabilitation is reduced; the likelihood of additional resources for revegetation and rehabilitation increases.	Revegetation process to include documented evidence of seeding and/or tube stock planting composed of a combination of appropriate native plant species. Source materials from accredited suppliers, schedule revegetation activities with reference to long term weather forecasts. Seed predation and native fauna grazing are hazards that are inherent.	Low	Possible	Low	Rehabilitation contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	ITPs completed for revegetation	AQP certification report	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)

Rehabilitation Milestones	Risk	Cause	Impact	Controls	Score			Responsibility	Resources	Performance measures	Monitoring Reporting	Timing Scheduling
					Consequence	Likelihood	Rating					
RM7	Unacceptable landform stability	Most likely a consequence of revegetation failure for relevant disturbance types; with respect to the void and its bund the conceivable cause would be a design failure.	The likelihood of additional resources for revegetation and rehabilitation increases. Accelerated mobilisation of contaminants that are beyond the assimilative capacity of the receiving environment.	All major earthworks completed in accordance with as constructed survey plan showing surveyed area contours, finished slope and conformance to designed landform and drainage. Void bund and void batters are formed in accordance with design.	Low	Unlikely	Low	Rehabilitation contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	Records retained for pit void bund construction	"as built" construction plans certified by AQP.	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground . Pit void and part of the bund is completed.
RM8	Low Intensity Grazing PMLU (former hard rock mining disturbance areas) is not achieved	Most likely a consequence of revegetation failure for relevant disturbance types.	A reduction if the productive capacity of the land.	Revegetation process to include documented evidence of seeding and/or tube stock planting composed of a combination of appropriate native plant species. Source materials from accredited suppliers, schedule revegetation activities with reference to long term weather forecasts. Seed predation and native fauna grazing are hazards that are inherent.	Low	Possible	Low	Rehabilitation contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	ITPs completed for revegetation	AQP certification report	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)
RM9	Industrial PMLU (former tailings TSF3) not achieved	Regulatory requirements not satisfied	In context of the relevant matters, discernible environmental impact is inconceivable.	Validation of the mechanism for retention of infrastructure post mining.	Low	Unlikely	Low	EA Holder	Personnel with knowledge commensurate with the task.	Documented validation	Documented validation	Complete by 2053
MM1	Void water level exceeds 365mRL	Water held in the void exceeds the predicted volume due to greater ingress or less evaporative loss.	In context of the relevant matters and without knowing the volume of the hypothesised exceedance, discernible environmental impact is inconceivable.	Void water model prepared inclusive of climate change scenarios. Establish weather station and maintain bore field monitoring network to collect site specific data during mine life. Manage relevant catchment drainage at closure.	Low	Unlikely	Low	EA Holder	Personnel with knowledge commensurate with the task.	Documented validation	Documented validation	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)
MM2	Void safety bund not installed	Non conformance (conceivable if the EA Holder defaulted and the security held by the State was not fit for purpose).	Presents a hazard to native fauna, stock and humans.	Bund has been designed and the designed independently certified. The bund in part is already constructed with another portion to be constructed during open pit mining.	Critical	Unlikely	High	Appropriately qualified and certified Contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	Certified site investigation report and as relevant site management plan	AQP certification report	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)
MM3	Void and its bund not satisfying landform stability	Non conformance in terms of the bund (conceivable if the EA Holder defaulted and the security held by the State was not fit for purpose).	Presents a hazard to native fauna, stock and humans.	Bund has been designed and the designed independently certified. The bund in part is already constructed with another portion to be constructed during open pit mining. Within six months prior to relinquishment, an appropriately qualified person certifies that as constructed landform achieves design criteria for geotechnical stability with a Factor of Safety (FOS) ≥ 1.5	Critical	Unlikely	High	Appropriately qualified and certified Contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	Certified site investigation report and as relevant site management plan	AQP certification report	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)
MM4	Portals, vents and egress points not banded or sealed	Non conformance (conceivable if the EA Holder defaulted and the security held by the State was not fit for purpose).	Present a hazard to native fauna, stock and humans.	Features linked to underground mining not within safety bund are sealed. This requirement applies to a nominal 2 portals (one 7 m x 4 m and another 6 m x 4 m, each with 50 m² aprons) and 2 (6 m diameter) vent rises. Within six months prior to relinquishment, an assessment undertaken by an appropriately qualified person who certifies that features linked to underground mining have been appropriately banded or sealed and are safe.	Critical	Unlikely	High	Appropriately qualified and certified Contractor under the direction of the EA Holder	Personnel and materials commensurate with the task.	Certified site investigation report and as relevant site management plan	AQP certification report	Commence 2053 (mine life of 30 years nominally 10 yrs for open cut which started 2023, and then nominal 20 yrs for underground)

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1.6.1 Rehabilitation trials

Rehabilitation trials were conducted on waste rock and tailings materials in 1993²¹. 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
- an absence of soil-seed contact was the likely cause of plants' inability to establish on the waste rock dump.

Additional trials are intended, the aims being to evaluate:

- production of organic matter on the tailings surface to improve soil quality and increase soil resource availability
- 'manufactured' soil material from existing onsite resources
- vegetation establishment on existing surfaces (*eg* hard stand areas) without the introduction of soil material.

1.7 Monitoring and maintenance

This section includes a monitoring and maintenance program that identifies and describes the monitoring systems that will be undertaken to demonstrate that milestones and milestone criteria have been achieved.

1.7.1 Maintenance monitoring and contingencies

Vegetation at rehabilitation areas should be monitored twice weekly for 4 weeks following establishment. Weed monitoring of newly established rehabilitation areas should be undertaken twice monthly for the first 3 months following establishment, and then monthly until the anniversary of establishment.

Potential maintenance issues and suitable remedial actions are provided in **Table 10**.

Table 10: Revegetation maintenance monitoring regime

Treatment	Potential maintenance issues	Suitable remedial action
Direct seeding (pastures)	Poor/no germination from direct seeding.	Investigate, check seed quality and germination records, review specification and records or works and re-treat (within the same wet season if possible or before the next wet season if not).
	Rapid die-off of seedlings following direct seeding.	Investigate, review specification, check soil quality, review records or works and re-treat (within the same wet season if possible or before the next wet season if not).
	Potential toxicity or deficiency (leaf discoloration or deformity).	Investigate and re-treat the area (re-seed) with species more tolerant of the conditions. Consider foliar application or fertiliser (see below).
Fertiliser (if required)	Development of persistent deficiency symptoms (yellowing, leaf margin necrosis, purple discolouration).	Investigate, test soils and/or foliage if problem not clear, apply fertilisers and develop top-dress maintenance regime as required.

²¹ NRA 1994, *Mount Carbine Report on Revegetation Trials*, prepared by Natural Resource Assessments Pty Ltd for Queensland Tungsten, 14 June 1994.

Contingency planning provides a framework for responding to significant failures as opposed to localised maintenance issues. The components of contingency planning are as follows.

- Monitoring programs are in place to provide warning of pending failure.
- Where failure has occurred or is imminent, it is necessary to evaluate:
 - the landform involved
 - the cause/nature of the failure
 - the receiving environment
 - risk assessment (likelihood and consequences of failure).

Failure of areas of revegetation and/or surface stabilisation is likely to occur and, in most instances, timely re-treatment will be the most appropriate response. However, response to significant failure events (*ie* failure events that are extensive or cannot be addressed by re-treatment) needs to be handled in partnership with the AA and in consultation with relevant stakeholders

1.7.2 Rehabilitation completion

The requirements for achieving rehabilitation completion and certification are detailed in the PRCP Schedule.

Analogue or reference sites are often used as a means of determining whether rehabilitation areas are approaching conditions similar to those that existed pre-mining. The usefulness of this approach depends on what attributes are being compared between sites and the rehabilitation objective. Where disturbance is minimal, or mining operations have had a minimal impact on landform, growing medium, slope and hydrology, the objective of returning land and vegetation to a condition similar to that which existed pre-mining is desirable and usually feasible. However, where the final landform created is different to the pre-mining or surrounding landscape in terms of slope, hydrology and soil profile, the recreation of a vegetation community similar to that pre-mining is almost impossible. For areas with a vegetation component and a PMLU of low intensity grazing, the use of analogue is required by the EA.

Achievement and verification of the revegetation works are managed through:

- as-built drawings/plans
- GIS mapping
- rehabilitation monitoring reports
- annual reports
- site investigation reports
- site management plans (where applicable).

Procedures, plans and reports are to be filed on-site and must be accessible on request by any appropriate authority.

1.7.3 Monitoring methods

Timing of monitoring

The timing of rehabilitation monitoring is summarised below. Monitoring will commence once rehabilitation areas become available and will be conducted annually until completion criteria have been successfully achieved.

Field vegetation monitoring methods

A 1:15,000 sampling scale will be adopted (*ie* approximately one observation per 9 hectares), for each site, the following records are kept:

- representative photographs
- GPS coordinates and site identification number
- measures of slope and aspect
- notes on erosion
- vegetation assessments along transects (see below)
- notes on presence of weeds.

Vegetation assessments

The vegetation assessments will be conducted using 50 m transects. Each site will be chosen through a stratified random or simple random selection process depending on the nature of the landform. The following measurements will be made.

- A species list will be compiled for each transect.
- All individuals of each tree species located within 10 m of transects will be recorded, providing a measurement of tree density. ‘Trees’ are defined as plants that commonly have a single woody stem and are ≥ 2 m in height.
- Groundcover will be measured within five separate 1 m² quadrats established at random along each transect. Within each quadrat, the percentage groundcover composition of vegetation, litter, rock(s), cryptogam/other or bare earth will be estimated. Dominance of each species of vegetation recorded in each quadrat will be measured by estimating the percentage composition of each species (to nearest 5%).
- Four reference sites will be monitored to provide benchmark data for tree density.

1.7.4 Data assessment

The data collected from monitoring sites is used to assess progress towards meeting the completion criteria in the PRCP Schedule.

Monitoring will be undertaken by a suitably qualified person(s) using appropriate quality assurance and data management processes and systems. This approach will ensure that work is undertaken by appropriately qualified, skilled and experienced individuals. Field data is recorded onto appropriate proforma by suitably qualified person(s); on return to the office relevant data is entered into digital format for data analysis and interpretation in accordance with established and accepted method. A quality assurance check on data entry is undertaken, and a technical review of the reporting is undertaken prior to finalisation. This method ensures the technical accuracy of data and interpretation.

1.7.5 Monitoring and maintenance post-closure

After successful rehabilitation, monitoring and maintenance will continue post-closure (terminating at lease relinquishment and the acceptance by the AA of surrender of the EA). The post-closure monitoring, to ensure milestone criteria has been demonstrated, will be against the success criteria in the PRCP Schedule.

Contingency strategies, if monitoring data indicates milestone criteria are not being met, identify incipient failures in the rehabilitation and, where failure has occurred, promote a timely response. Contingency strategies provide a framework for responding to a failure as opposed to itemising all possible failure events (and the magnitude of failure). The monitoring program serves to provide warning of pending failure. The maintenance measures promote continuity of rehabilitation success.

2. Appendices and Attachments

The completed PRCP Schedule and any relevant required reports/plans and figures are included in this section.

The PRCP Schedule is included as **Appendix 6**.

Spatial information relating to the PRCP is in **Appendix 7**.

References for the PRCP report are in **Appendix 8**.



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