Brolga Project

Tenure number: ML5866 and ML5864

Environmental Authority: EMPL01624913

Progressive Rehabilitation and Closure Plan

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Terms and Abbreviations

°C	Degrees Celsius
AEP	Average Exceedance Probability
ANC	Acid Neutralising Capacity
AMD	Acid Mine Drainage
ANZECC and ARMCANZ	Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ)
AQP	An Appropriately Qualified Person, means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature
ARD	Acid Rock Drainage
ASLP	Australian Standard Leaching Procedure
BGL	Below Ground Level
BPA	State Biodiversity Planning Assessment
BoM	Bureau of Meteorology
CSIRO	The Commonwealth Scientific and Industrial Research Organisation
DAF	Queensland Department of Agriculture and Fisheries
DEHP	Queensland Department of Environment and Heritage Protection (former)
DEM	Digital Elevation Model
DES	Queensland Department of Environment and Science
EA	Environmental Authority
EC	Electrical conductivity
EFA	Ecosystem Function Analysis
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EP Act	Queensland *Environmental Protection Act 1994*
EP Regulation	Queensland Environmental Protection Regulation 2019
EVNT	Endangered, Vulnerable or Near Threatened taxa
GBR	Great Barrier Reef
GNP	Gladstone Nickel Project
IPCC	The Intergovernmental Panel on Climate Change
LGO	Low Grade Nickel Laterite Ore
LOX	Line of Oxidation
MERFP Act	Queensland *Mineral and Energy Resources (Financial Provisioning) Act 2018*
Mg/L	Milligrams per Litre
ML	Mining Lease
MNES	Matters of National Environmental Significance
MPA	Maximum Potential Acidity
MSES	Matters of State Environmental Significance

NAPP	Net Acid Producing Potential
NC Act	Queensland *Nature Conservation Act 1999*
NAG	Net acid generation
NAF	Non-acid forming
PMLU	Post Mining Land Use
PRC	Progression Rehabilitation and Closure
PRCP	Progression Rehabilitation and Closure Plan
PRCP Guideline	Department of Environment and Science, Progressive Rehabilitation and Closure Plan Guideline (ESR/2019/4964)
PVC	Polyvinyl Chloride
Qld	Queensland
QNI	QNI Resources Pty Ltd and QNI Metals Pty Ltd
RA	Rehabilitation Area
RAB	Reverse Area Blast
RM	Rehabilitation Milestone
RE	Regional Ecosystem
ROM	Run of Mine
RT	Rehabilitation Trial
SEIS	Supplementary Environmental Impact Assessment
The Project or the Brolga Project	ML5866and ML5864, which operate under Environmental Authority EMPL01624913
WQOs	Water Quality Objectives
Yabulu Refinery	The Palmer Nickel and Cobalt Refinery in Yabulu, Townsville, Queensland

1 Introduction

The Brolga Project is owned by QNI Resources Pty Ltd and QNI Metals Pty Ltd (collectively referred to as 'QNI').

The Project is located about 55 kilometres north of Rockhampton, along the Bruce Highway (see Figure 1-1 to Figure 1-3).

The Project includes two mining leases (MLs), ML5866 (Brolga, or the Brolga ML) and ML5864 (Canoona, or the Canoona ML) which operate under Environmental Authority (EA) EMPL01624913. Collectively, the two MLs are referred to as 'the Brolga Project', or 'the Project'. The Project formerly supplied nickel to the Palmer Nickel and Cobalt Refinery in Yabulu (the Yabulu refinery), Townsville, Queensland. However, both MLs are currently in 'Care and Maintenance' as a result of the suspension of nickel refining at the Yabulu refinery.

Mining operations at the Brolga Project were relatively simple: at ML5866 nickel-oxide ore was mined from the lateritic regolith, overburden was stockpiled, the ore was screened to remove large rocks, then hauled to the nearby Glen Geddes railway siding and transported via rail to the Yabulu refinery.

ML5864 Canoona has been explored and drilled but no extraction of ore has occurred.



Figure 1-1. Location Map ML5866 and ML5864

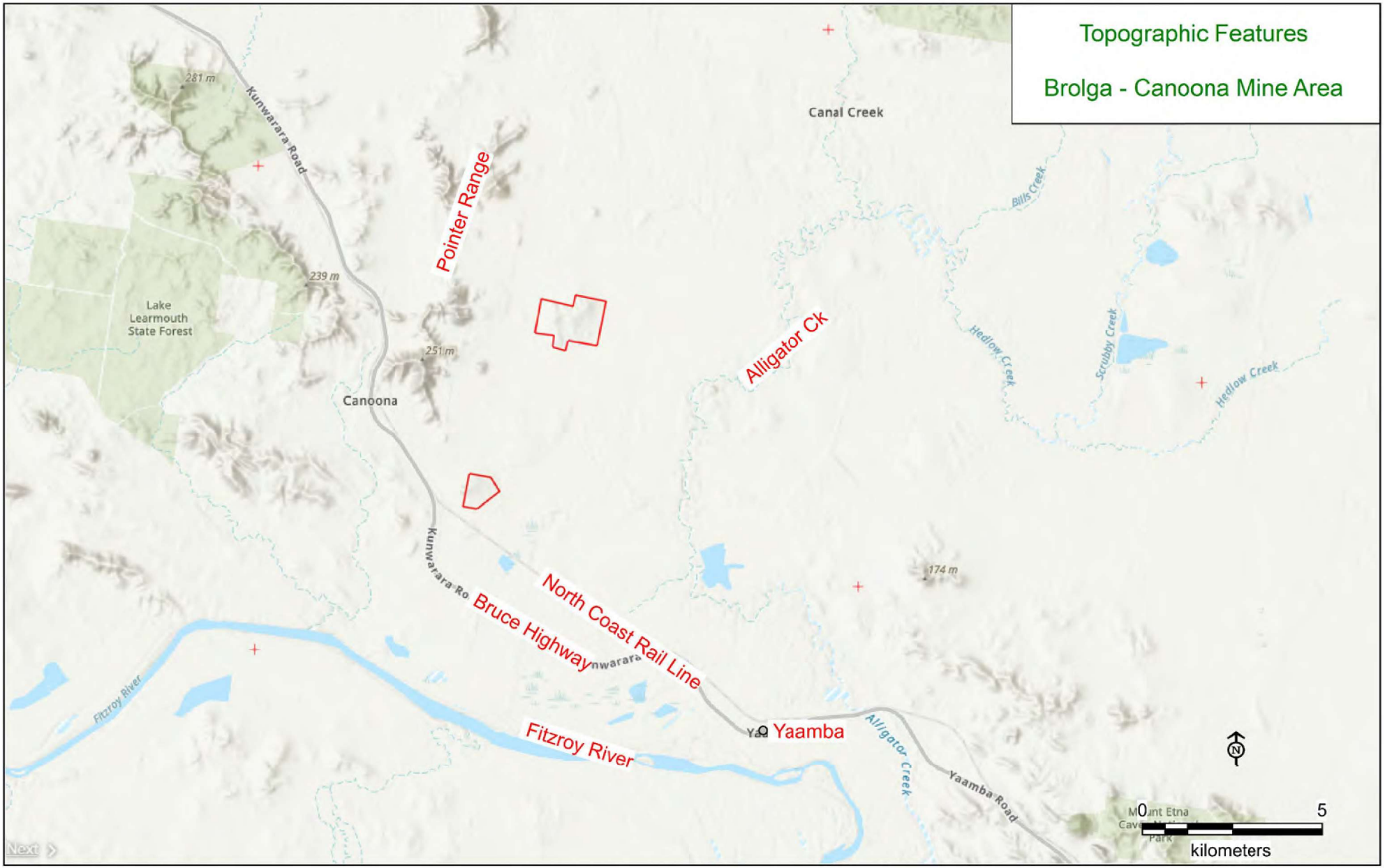


Figure 1-2. Brolga Canoona Topographic Features



Figure 1-3. Brolga Canoona Satellite Image

1.1 Purpose and Scope

This document sets out the rehabilitation activities that will take place on the Brolga Project. This Progressive Rehabilitation and Closure Plan (PRCP) has been prepared with reference to requirements for the preparation of a PRCP as set out in the Queensland Department of Environment and Science's Progressive Rehabilitation and Closure Plan (PRCP) Guideline (ESR/2019/4964) (PCRP guideline) (DES 2021) effective from 17 March 2021. As per the PRCP Guidelines, the PRCP consists of two parts:

- Rehabilitation planning part – this report
- PRCP schedule - Appendix 1 of this report.

As required by the PRCP Application Form, the structure of this report (i.e. the Rehabilitation planning part) is set out according to the formatting/structural requirements listed in Appendix 1 of the PRCP Application form (ESR/2019/4957).

1.2 Regulatory Context

An Environmental Authority (EA) with number EPML01624913, issued under the *Environmental Protection Act 1994,* for the Brolga Project was approved on 7 November 2013 for Schedule 3 Environmentally Relevant Activity, 15 - mining nickel ore (site specific). The current version of EA EPML01624913 is effective from 23 June 2021[1]. Obligations within the EA also apply to the progressive rehabilitation activities.

Mining operations, including rehabilitation, are regulated under the *Queensland Environmental Protection Act 1994* (EP Act) and *Environmental Protection Regulation 2019* (EP Regulation). As a result of the passing of the *Mineral and Energy Resources (Financial Provisioning) Act 2018* (MERFP Act), the EP Act was amended such that all new and existing EA holders for a mining activity relating to a mining lease approved through a site-specific activity must prepare a PRCP after receiving a Notice from the Department of Environment and Science (DES). The MERFP Act includes transitional provisions for the application of the PRCP requirement concerning existing mines such as the Brolga Project.

For existing mines, the transitional provisions mean that existing 'land outcomes' (which are Post Mine Land Uses (PMLUs) and associated completion criteria) secured in a 'land outcome document' received by DES (and not rejected) before December 2018 can be carried forward (and do not need community consultation or stakeholder agreement). According to Section 750 of the EP Act a 'land outcome document' can be:

a. an Environmental Authority (EA) for a resource activity
b. a document made under a condition of an EA that:
    - relates to the management of a void or rehabilitation of land (e.g. rehabilitation and closure plan or residual void management plan), and
    - was provided to the administering authority, and had not been superseded, before 30 November 2018, and

[1] Prior to this date the EA included another ML - ML 7048 – this was an infrastructure lease, was not mined or explored, and has since been relinquished.

- before 15 January 2019, the administering authority had not notified the EA holder that the document was insufficient.

a. a document made under a condition of an EA that:
   - relates to the management of a void or rehabilitation of land (e.g. rehabilitation and closure plan or residual void management plan) and
   - was provided to the administering authority between 20 November 2019 and 30 November 2021; and
   - within 20 business days after receiving the document, the administering authority had not notified the EA holder that the document was insufficient.

b. a report evaluating an EIS under section 34D of the State Development and Public Works Organisation Act 1971

c. an EIS assessment report

d. a written agreement between the EA holder and the State that is in force on 30 November 2018.

The PCRP guideline specifies that the land outcome document list is hierarchical and if there are inconsistencies between these documents on either the final outcomes or details of the outcome, then the document appearing first in the above list will prevail to the extent of the inconsistency.

For the Brolga Project, the relevant documents are:

- The EA - EMPL01624913 (see Appendix 2)
- The 'Brolga Rehabilitation Management Standard (QN-BR-STD-012)' (see Appendix 3).

The Brolga Rehabilitation Management Standard was prepared to satisfy conditions G1 – G9 (Land and Rehabilitation) of the EA (EMPL01624913). The document was approved on 28 May 2014 and was the rehabilitation management plan being utilised prior to the enactment of the *Mineral and Energy Resources (Financial Provisioning) Act 201*8 (MERFP Act) which brought about the requirement to submit this PRCP. The Brolga Rehabilitation Management Standard specifies a post mine land use of grazing.

2 Project Planning

2.1 Site Location

Environmental Authority EMPL01624913 is located near Glen Geddes, about 55 kilometres north of Rockhampton, along the Bruce Highway (see Figure 1-2). It contains two mining leases, ML5864 Canoona and ML5866 Brolga, which are located about five kilometres apart, and near the Bruce Highway. Both are located in the Livingstone Shire Council in the Rockhampton Mining District. The small township of Yaamba is located approximately 13 km south east of the project. The Glen Geddes rail siding is located approximately 5 km to the west of the Brolga ML adjacent to the North Coast rail line.

2.2 Project Description

2.2.1 Mining Tenements

The Brolga Project consists of two granted MLs, ML5864 Canoona (64.49ha) and ML5866 Brolga (202.69ha) which operate under EA EMPL01624913. Obligations within the EA also form part of the progressive rehabilitation activities. For example, for the Brolga ML, maintenance of levees and dams to control sediment and runoff is also fundamental to rehabilitation activities and to control the quality of water on the site.

ML5864 was initially granted on 13 June 1991 with a commencement date of 1 July 1991 and expiry date of 30 June 2031. ML5866 was initially granted on 20 July 1989 with a commencement date of 1 August 1989 and expiry date of 31 July 2020. A renewal application has been duly submitted for ML5866. Both MLs have been held by QNI Resources Pty Ltd (80%) and QNI Metals Pty Ltd (20%) since 27 March 1995. ML5864 Canoona covers a surface area of 64.49 hectares and ML5866 Brolga covers a surface area of 202.69 hectares.

2.2.2 Primary features /infrastructure

The primary features of the mine at the Brolga ML are described below and in Table 2-1. Figure 2-1 gives the location of each of the primary features.

There are three pits currently open which cover a total area of 11.3 hectares. Two of these pits have been excavated into the slope of the Brolga hill (Pit 8 and Pit 2 Extension). The elevation of the deepest part of Pit 8 is 19.9 metres, compared with its pre-mining, natural elevation of 34.1 metres. The deepest elevation of Pit 2 Extension is 20.5 metres, compared with its pre-mining, natural elevation of 42.5 metres. Pit 1 was excavated from the top of the hill. Its current deepest elevation is 47.6 metres, compared with its pre-mining, natural elevation of 67.3 metres.

All other pits are either back-filled or have had substantial backfilling, and became areas for mining operations such as screening or stockpiling (eg. ROM, Screening Stockpile, Go Line Pad). All other pits were also cut into the side of the hill. The landform that results from the back-filling is of a terraced form, rather than the sloping form that was previously the surface shape.

Most of the pits are more or less contiguous at the surface, and located on the eastern side of the hill, the exception being Pit 1, located at the top of the hill.

Most other mine features are out-of-pit dumps. Each of these has been formed into gently sloping terraced landforms, as a result of the knowledge that the post-mining land use would be grazing,

and as a strategy to ensure stability. They were built as gently sloping areas that drained towards areas that were unlikely to be degraded by erosion. These pads have batters that were made mainly from the large rocks that were gained by the screening process. This was a measure against the probability of erosion. Some were used as pads for mining operations (Go Line Pad, Top Pad and Front Pad). One was used exclusively for waste rock/overburden dump (Waste Rock Dump).

Large high spoil dumps with long steep slopes were never made. The existing back-filled pits have been designed to slope gently, drain so as to minimise erosional scouring and be easily converted to pasture areas.

There is one mine feature that was not formed into a flat or terraced landform – the Nontronite Stockpile. It is a stockpile on the Go Line Pad with a volume of 50,000 cubic metres that was managed as ore, but was downgraded to waste as a result of refining challenges. Proposed rehabilitation activity for this feature includes flattening it to a terraced landform.

There are five small pits that were used for refining tests with a total area of 0.45 hectare (the test pits).

Existing rehabilitation, all as back-filling of mined-out pits and associated bunding, covers an area of 19.5 hectares, and other historical rehabilitation areas are described in Section 2.7.

The only other mine features are the Haul Road and Bath-house Area.

Table 2-1 below gives a brief description of each mine feature and Figure 2-1 gives the locations.

Table 2-1. Summary description of current Brolga ML features

Mine Feature	Description
Test Pits	Five small pits that were used for refining tests.
Pit 1	A mined void excavated from the top of the hill. Its deepest elevation is 47.6 metres, compared with its pre-mining, natural elevation of 67.3 metres.
Pit 2	A mined void. Pit 2 has already been back-filled.
Pit 3/Oversized Dump	A mined void. Pit 3/Oversized Dump has been 70% back-filled.
Pit 4	A mined void. Pit 4 has already been back-filled.
Pit 5 North	A mined void.
Pit 5 South	A mined void.
Pit 8	A mined void excavated into the slope of the Brolga hill. The elevation of the deepest part of Pit 8 is 19.9 metres, compared with its pre-mining, natural elevation of 34.1 metres.
Topsoil Dump 2 & Topsoil Dump 3	Topsoil stockpile areas.
Nontronite Stockpile	Stockpile of ore that is high in nickel, but also in nontronite (an iron rich type of smectite clay) and cannot, at this stage, be economically extracted. Located on the Go Line Pad.
Top Pad	Out-of-pit dump for waste formed into pad for mine operations. Used as a parking, turn-around and pit exit point.
Go Line Pad	Out-of-pit dump for waste formed into pad for mine operations. Became an area used for parking of machinery and the location of the Nontronite Stockpile.
ROM	Ex pit that has had substantial backfilling, and became an area for run of mine (ROM) mining operations (where ore was stockpiled for screening and loading).
Screening Stockpile	Ex pit that has had substantial backfilling and is a stockpile for excavated low-grade ore ready for screening.
Pit 2 Extension	A mined void excavated into the slope of the Brolga hill. The deepest elevation of Pit 2 Extension is 20.5 metres, compared with its pre-mining, natural elevation of 42.5 metres.

Mine Feature	Description
Waste Rock Dump	Out-of-pit dump for waste. Comprised exclusively of Waste Rock.
Front Pad	Out-of-pit dump for low grade ore formed into pad for mine operations. Used for stockpiling and parking of machinery.
Topsoil Dumps 1, 4, 5, 6, 7	Topsoil stockpile areas.
Haul Road	The Haul Road network contains 2.82 kilometres of compacted tracks. They are unsealed formed roads built using overburden from the upper red-brown lateritic layer, an ideal road-base material.
Bath-house Area	The bath-house includes two adjacent demountable structures (shower and toilet block) with a septic tank, rainwater tank, underground PVC pipe to the rainwater tank, and some concrete paths and pads, all contained in a single clearing area.
Dam 4	Dam 4 is located on the eastern boundary of ML5866.

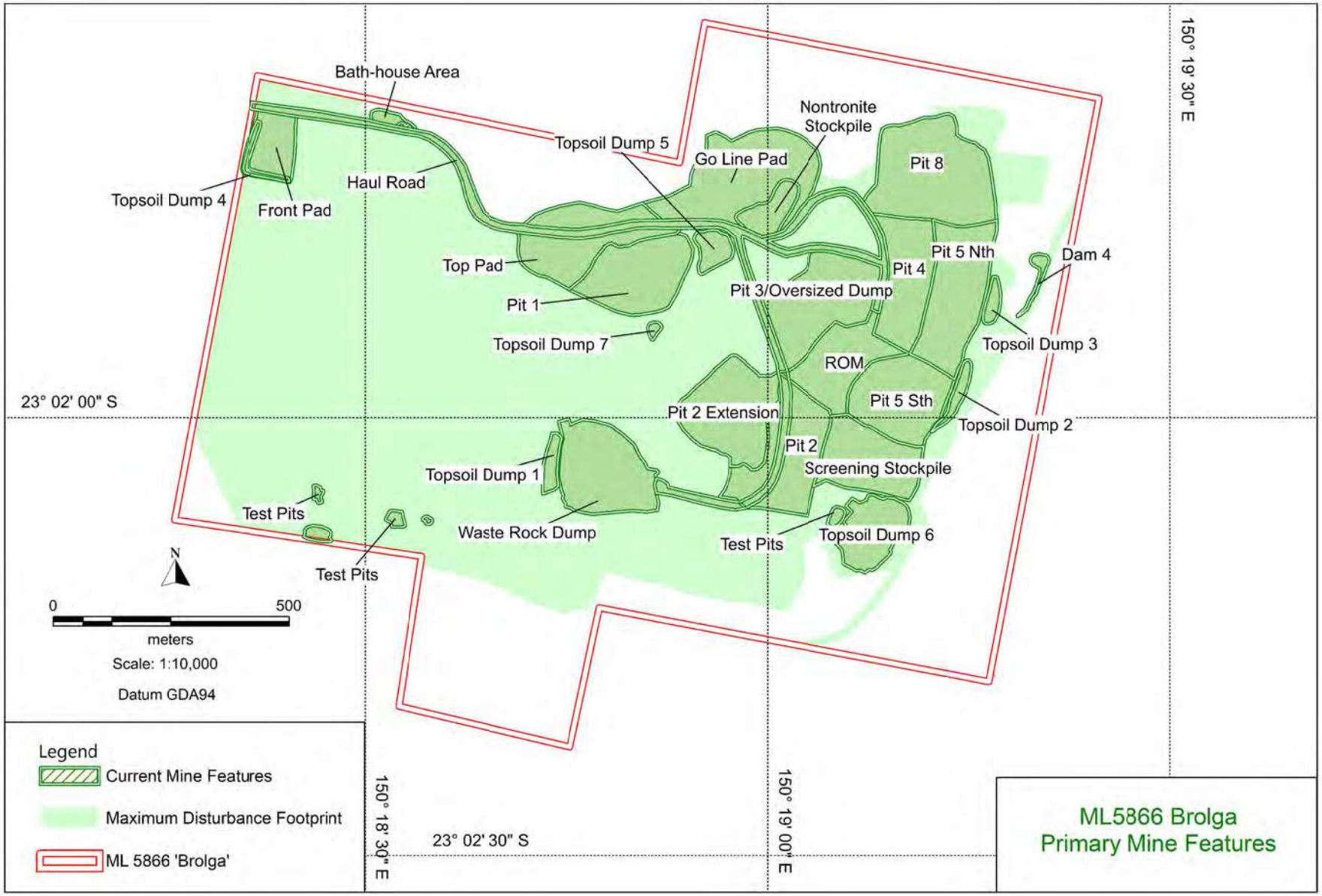


Figure 2-1. Current Brolga ML features

2.2.3 Type of mining operation

2.2.3.1 Background

Mining has occurred on ML5866 Brolga only. No mining activity, other than exploration, has taken place on ML5864 Canoona.

ML5866 Brolga area was mined during 1993-95, under a different tenement holder, but mining records from that period are not held by QNI. Consequently, some areas of ML5866 have already been mined, back-filled and rehabilitated (see Section 2.7.1 for a description of the former rehabilitation), but these areas were not known or recognised by QNI until new excavations revealed them.

Mining re-commenced under QNI on ML5866 Brolga in 2012 and continued until 2016. The mine has not operated since 2016 and is currently in care and maintenance as a result of the suspension of nickel refining at the Yabulu refinery. Current rehabilitation, in the form of back-filling in mined-out pits and associated bunding, covers an area of 19.5 hectares (see Section 2.7.2 for a description of the existing QNI rehabilitation).

2.2.3.2 QNI mining method at Brolga ML

Between 2012 and 2016, nickel ore was mined from ML5866 Brolga in a simple shallow open-cut mine operation.

Several metres (usually four to six) of overburden, consisting of red-brown laterite rock, were removed from the surface to expose the ore directly beneath. The ore is a pale-coloured saprolitic rock containing nickel-oxides and nickel-bearing silicates (smectite clays). Blasting was not used as excavators were capable of digging the ground to the depths required.

The areas that are referred to as ‘Pits’ in this document are basically a continuous arrangement of adjacent orebodies, rather than distinctive and separate excavations. The Life-of-mine Schedule from the time (QNI, 2014) refers to pits of about half a hectare to two hectares, which are frequently contiguous with, or very close to, other pits. Pit depths are about 20 metres deeper than surrounding topography. The depths of overburden removal have varied from two metres to about ten metres at the deepest, but was typically between four and six metres.

Mining on ML5866 under QNI commenced in 2012 at Pit 1 and Pit 2. Overburden waste rock was dumped to form the Waste Rock Dump and the Go Line Pad. Ore was first stockpiled on the Go Line Pad, which was at that time, the Run-of-Mine pad. That ore is now called the Nontronite Stockpile (see below).

Mining continued progressively to Pits 3, 4 and 5 by 2015, and most recently, Pit 8 by 2016. Overburden from Pits 3, 4 and 5 was dumped at the Front Pad to be pushed-out to make a versatile pad for various uses including parking of machinery and stockpiling of ore. Other overburden was dumped in mined-out pits.

The ore was stockpiled and screened at the mine, then trucked to the nearby Glen Geddes railway siding for loading on to trains and transport to the Yabulu refinery in Townsville. The only on-site beneficiation process was the screening to remove large rocks.

Processing challenges at the Yabulu refinery resulted in the recognition that some ore was high in iron content and contained nickel which could not be extracted economically. This ore is termed ‘Nontronite’ (after the relevant mineral) and was excluded from mining reserves. Consequently, the

original mining plan was modified. Existing nontronite-bearing rock remains on ML5864. The nontronite-bearing stockpile will be rehabilitated in a manner that makes it easily accessible should a revised processing method be identified in the future.

2.2.3.3 Exploration on Canoona ML

Mining has not occurred on ML 5864 Canoona; however, the site has had several exploration holes drilled as part of two phases of exploration. The first was under Authority to Prospect (ATP) 294M in the 1970's; the second under mining lease ML5866 during 1994 – 1996.

Exploration reports detail 109 holes drilled in Canoona between 1970 and 1972, nine of which were large-diameter (one-metre) holes. The drilling method for the majority of these holes was 'reverse air blast' (RAB - diameter 100 mm) - a routine drilling method at that time. Shallow RAB holes required no pit, and were all vertical so no additional clearing other than the track was required to accommodate the rig. Holes of these depths (less than 30 metres) were spaced about 75 metres apart and each would have been completed in a few hours. The size of the rig truck was probably about 10 metres long to mount the Mayhew-1000 rig. Sufficient air pressure for these shallow holes would have been supplied by the air-compressor mounted on the drilling truck, so no other trucks would have been required.

The nine large-diameter drill sites required more machinery and a larger clearing. The deepest of the large-diameter holes was 25 metres. One of them had a trench dug adjacent it, with a maximum depth of ten metres, and 40 metres in length.

Follow-up exploration drilling occurred during 1995. By that time, the industry standard transformed to a drilling technique known as reverse-circulation drilling, a method that has less sampling error. Drilling access tracks of the previously disturbed area were upgraded to provide access for this program. This phase of drilling affected approximately three-quarters of the previously disturbed area. No exploration or any sampling activity has occurred in Canoona since that time.

2.2.4 Proposed Duration of Operation

The current life-of-mine plan includes rehabilitation works only.

The previous life-of-mine plan that was in place prior to the suspension of the Yabulu refinery included a schedule to continue nickel ore mining on ML5866 for at least two years, and then commence mining on ML5864 for a further two years.

Currently, there is no other refinery to which the ore can be sent to maintain the economic viability for the mine. For this reason, the previous life-of-mine plan became redundant and was replaced with a plan which includes rehabilitation works only.

Rehabilitation works are planned to commence in 2024 and continue in an active state until 2028, after which monitoring of the rehabilitated areas will continue until 2031. If a stable final landform and post-mining land use is achieved by that time, an application to surrender the Environmental Authority may be made.

Should the Yabulu refinery recommence activities during the proposed PRCP period, a new life-of mine plan will be developed and appropriate amendments to the PRCP sought to enable mining and rehabilitation under a revised schedule.

2.3 Baseline Information

The following sections provide baseline information relevant to the land covered by EA EMPL01624913. The sections are consistent with the recommended topics listed in the PRCP Guidelines but follow the structure specified in Appendix 1 of the PRCP Application Form (ESR/2019/4957).

2.3.1 Site topography

Orthophotos and topographic data acquired in 2020 show the current features of land within ML5866 (Figure 2-2, Figure 2-3 and Figure 2-4). Satellite imagery from GeoResGlobe is provided for ML5864 in Figure 2-5, Figure 2-6 and Figure 2-7.

2.3.1.1 Brolga

The Brolga ML is situated on a topographically elevated feature that is surrounded by Quaternary alluvial sediment. It is a lateritised remnant of serpentinite on the south-eastern periphery of the Princhester Serpentinite, in the geological province known as the 'Marlborough Block'.

The Brolga ML ranges from around 20 to 70 metres above sea level, with the highest elevation near the northern side of the mining lease boundary. On the surrounding land, elevations are approximately 20 metres above sea level on the east, west and south sides, and between 20 and 50 on the north side (see Figure 2-2). Most of the surrounding relief is quite flat, gradually descending eastward to Alligator Creek.

Two kilometres west of Brolga is the Pointer Range, also part of the Princhester Serpentinite. Four kilometres east of Brolga is Alligator Creek, which meanders southward to the Fitzroy River.

2.3.1.2 Canoona

The Canoona mining lease is also situated on a topographically elevated feature surrounded by Quaternary alluvial sediment. It is also a lateritised remnant of serpentinite on the south-eastern periphery of the Princhester Serpentinite, also part of the 'Marlborough Block'.

The highest elevations on Canoona are about 75 metres above sea level, near the western mining lease boundary. The elevations are between 20 and 25 metres above sea level on the southern and eastern boundary, and 25 to 35 metres above sea level on the northern boundary. On most of the surrounding land elevations are approximately 20 metres above sea level (see Figure 2-6). Most of the surrounding relief is quite flat except for some other low remnant hills of the serpentinite, gradually descending eastward to Alligator Creek.

Run-off from the Canoona area flows into the surrounding Quaternary alluvium, and south and south-eastward to Alligator Creek and the Fitzroy River.

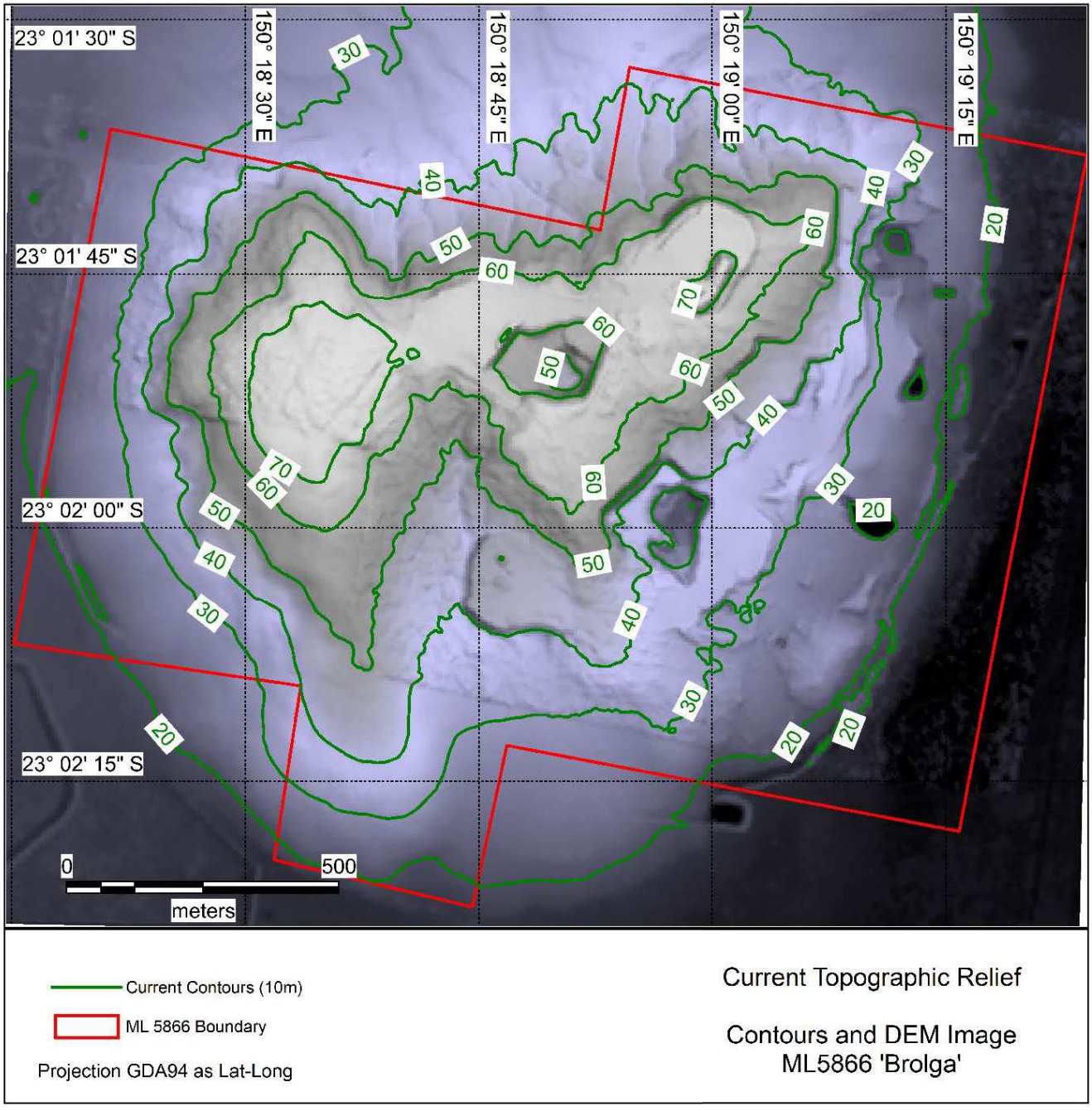


Figure 2-2. ML5866 Brolga Current Topographic Relief

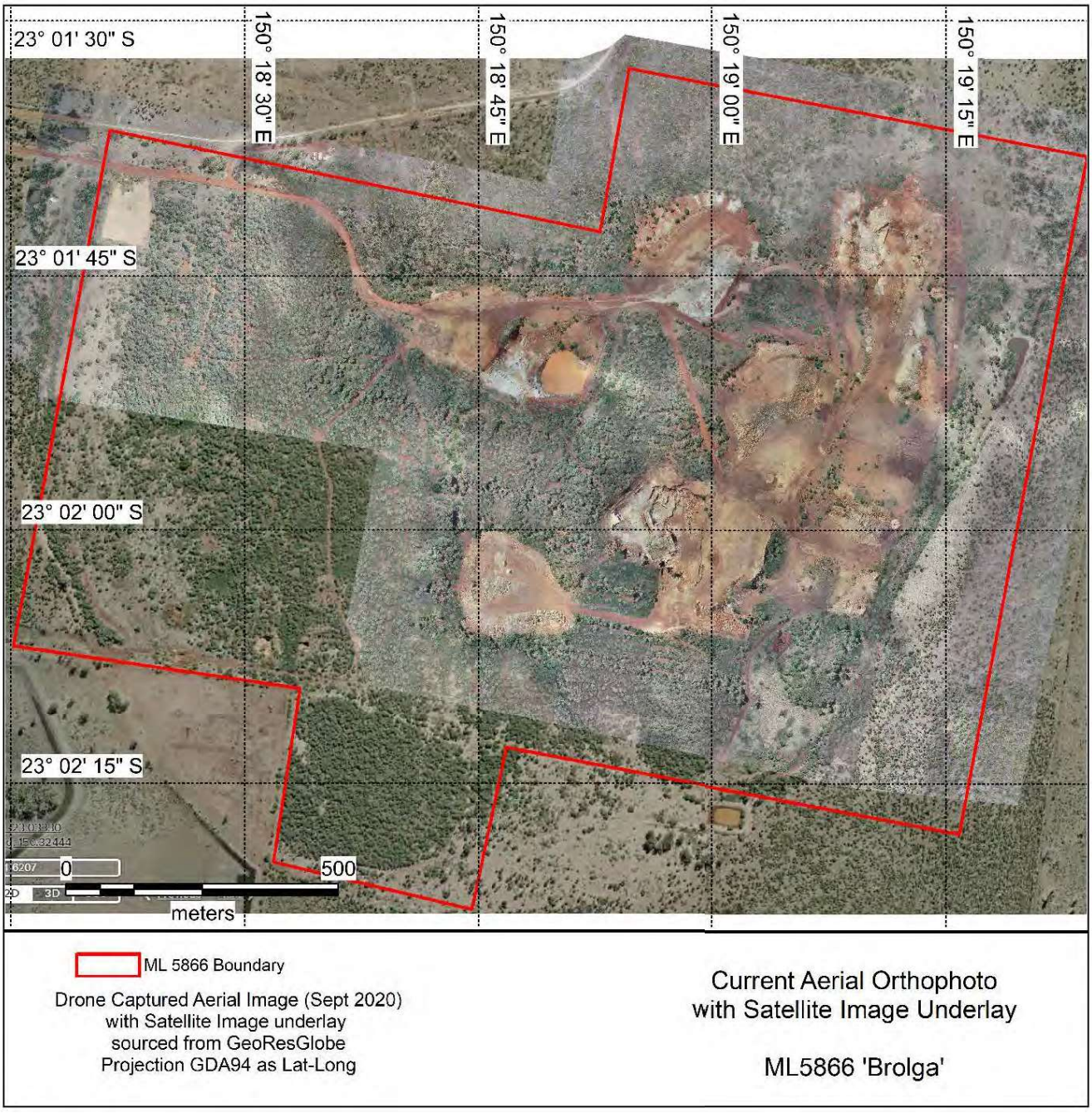


Figure 2-3. ML5866 Brolga Current Aerial Orthophoto

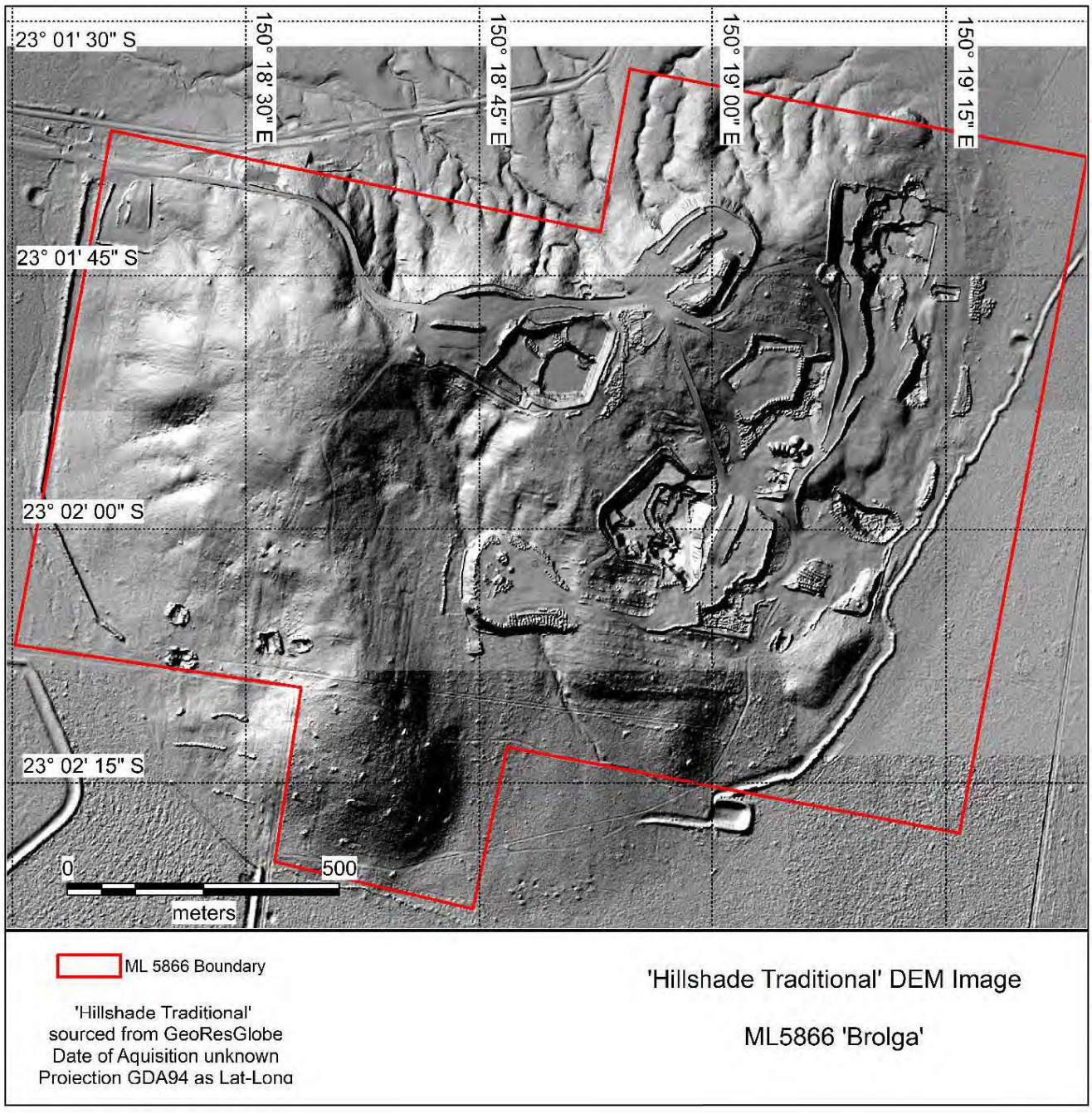


Figure 2-4. ML5866 Brolga Digital Elevation Image

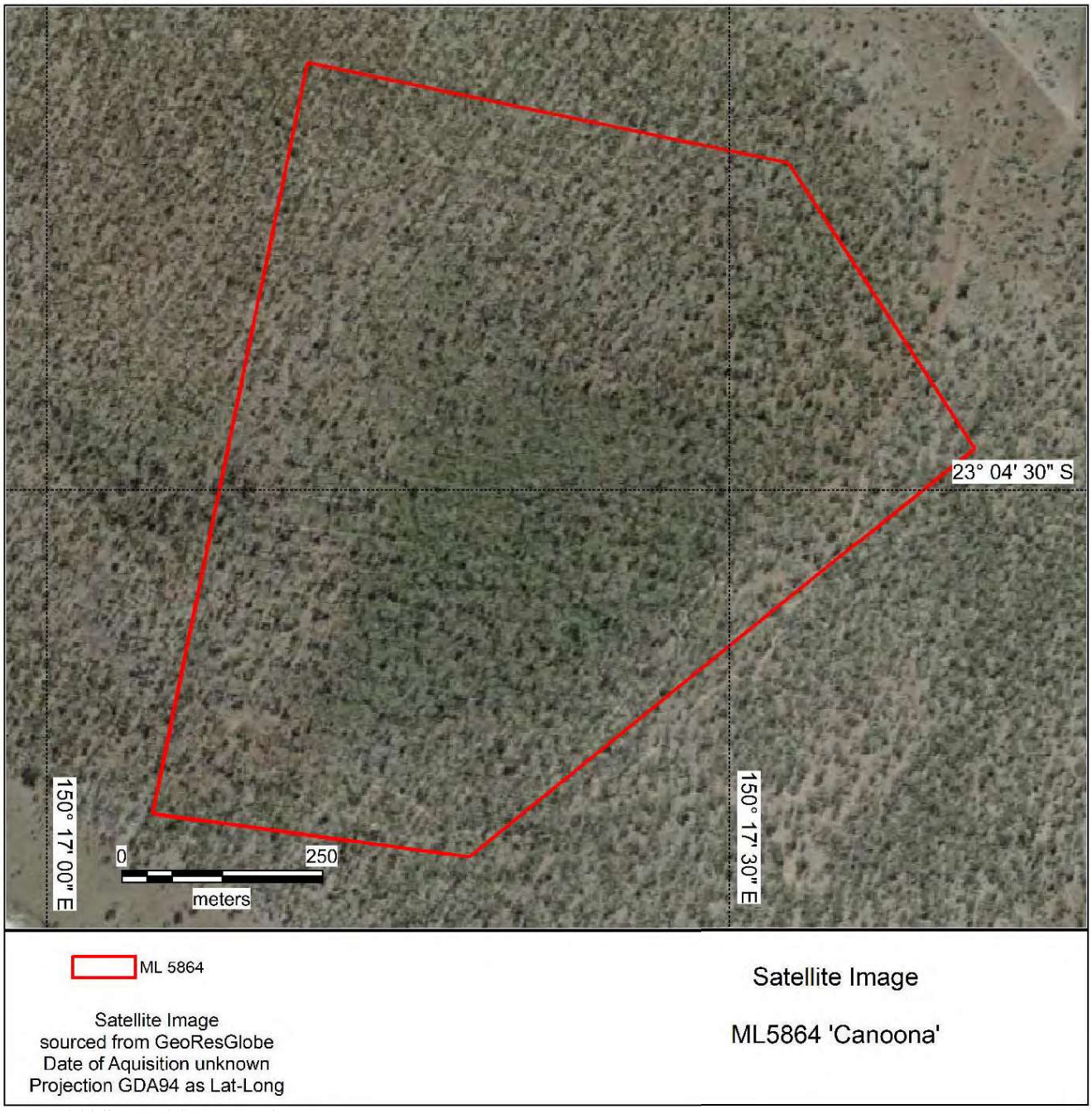


Figure 2-5. ML5864 Canoona Satellite Image

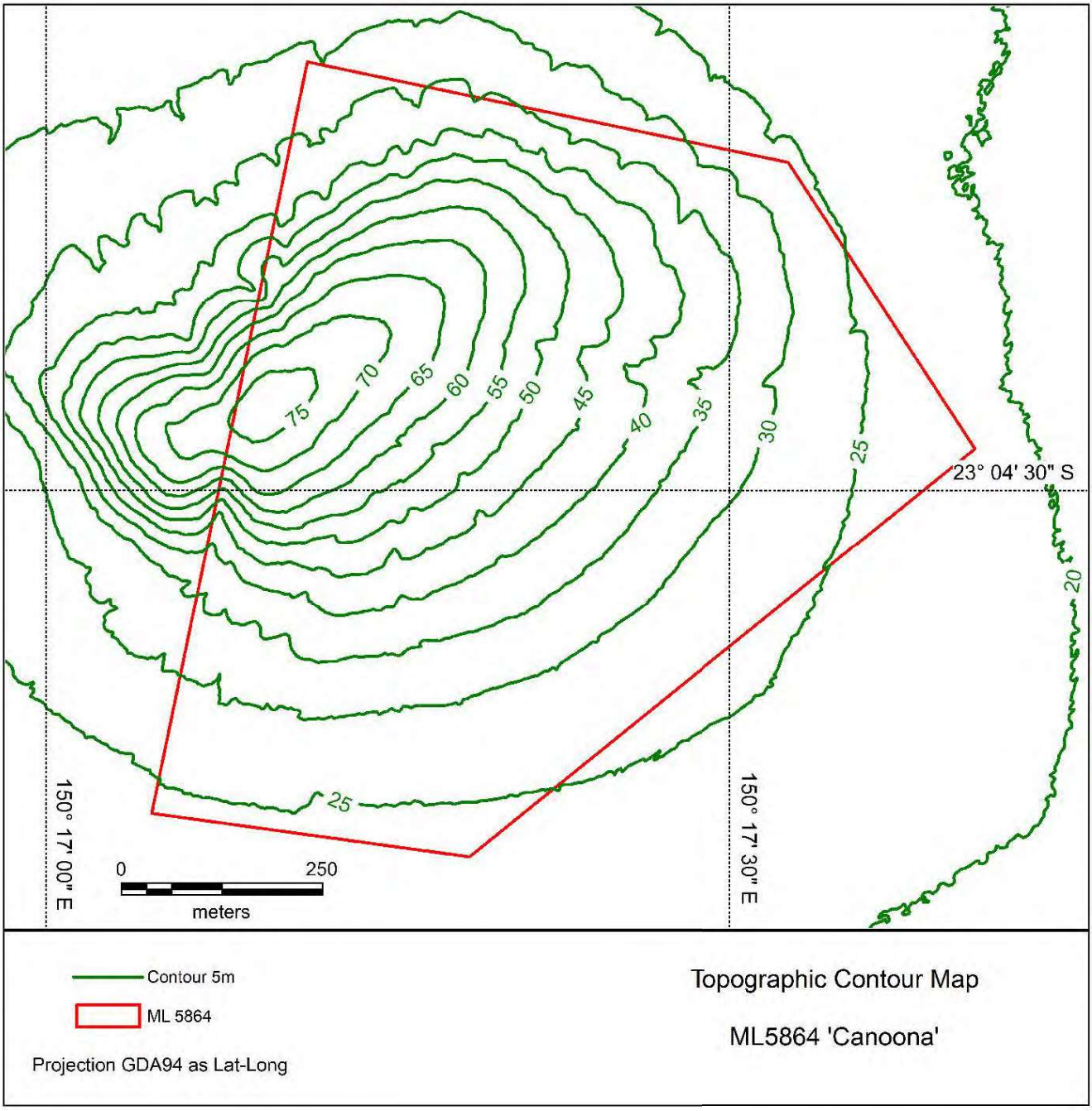


Figure 2-6. ML5864 Canoona Topographic Contours

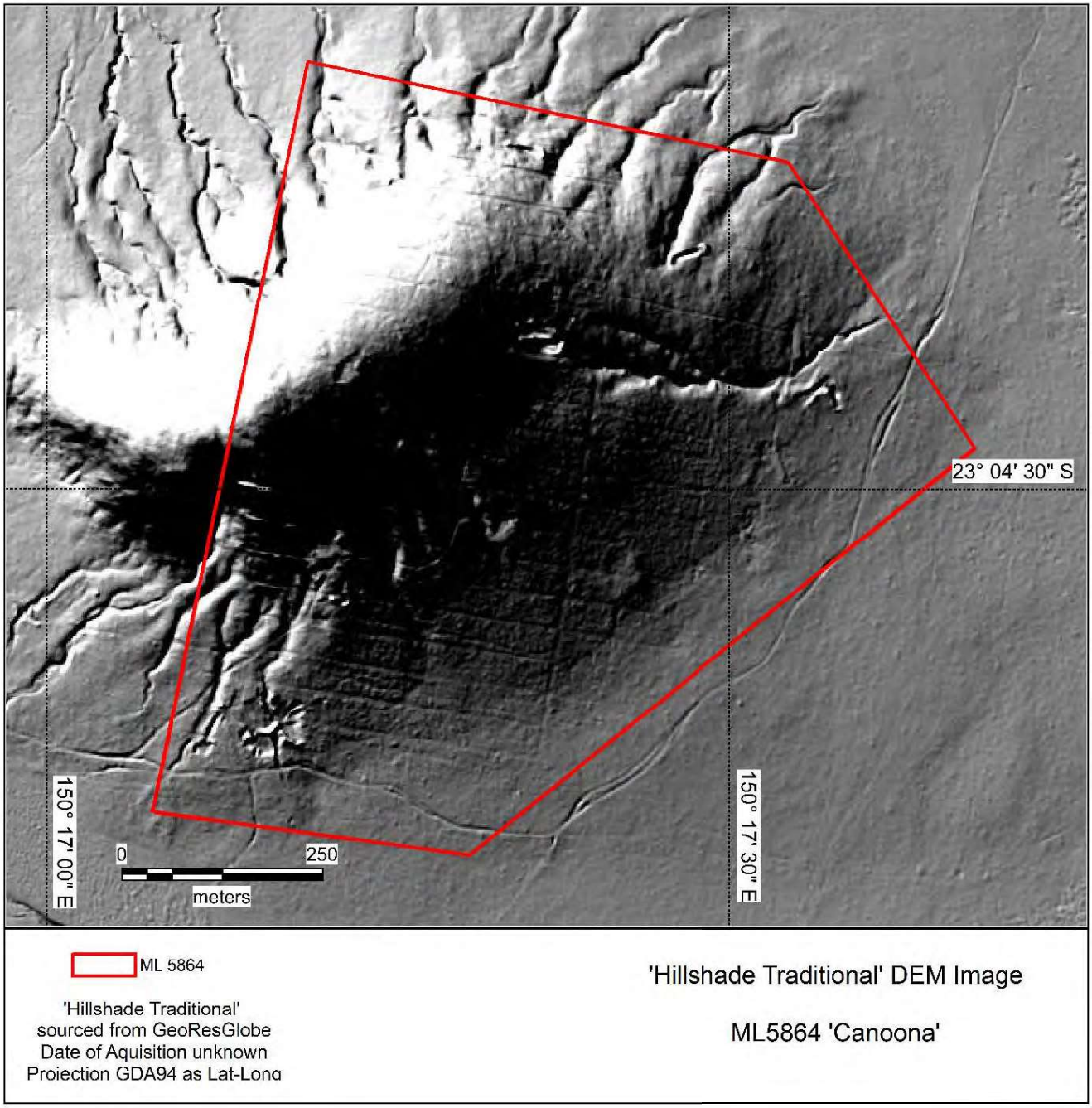


Figure 2-7. ML5864 Canoona Digital Elevation Image

2.3.2 Current landform

ML5866 Brolga contains several pits, some are open on ore, others are open for backfilling (see Figure 2-3). Some pits have been mined-out, backfilled and prepared for other uses such as the run-of-mine stockpiling (ROM) and screening of newly mined rock. There is one overburden dump and several pads that have been built using overburden material, variously used for parking and stockpiling. A network of haul roads links all the pits, general use and stockpile areas, and exploration and access tracks provided access to most other areas during the original exploration campaign and early mining activity.

The mine area also includes several topsoil stockpiles and bulk-sample pits. A water tank, septic system and showers are located near the entrance to the mine. Contour banks and dams control water run-off, storage and use.

The western part of ML5866 was cleared of vegetation in the 1990's and some parts of it were mined during that time under a former tenement holder. This western area has since been back-filled and revegetated.

The current landform of the Brolga ML is described in more detail in Section 2.2.2, and the features shown on Figure 2-1 and Figure 2-3.

ML5864 has not been subject to any mining activity. Numerous holes were drilled within it and those drill sites are linked by the remnants of the tracks that were made for that purpose. No other infrastructure is within ML5864 and no work has been done there since the 1990's.

2.3.3 Climate

The climate is classified as subtropical, within the south-east trade wind belt. Being close to the Tropic of Capricorn, the monsoonal influence is diminished. Similarly, the influence of high latitude cold fronts is diminished. Winds are predominantly from the south-east, with some north-east sea breezes in spring and summer. Some general trends from the area are:

- A distinct wet season during the months of December, January and February, with monthly rainfall averages greater than 100 mm.
- A distinct dry season between the months April through October with less than 50 mm mean monthly rainfall between these months.
- Evaporation rates that are highest during the summer months, and lowest mid-year. In any given month, the average evaporation is greater than the average rainfall.

2.3.3.1 Rain

Rainfall data indicates distinct wet and dry seasons. Mean monthly rainfall (calculated from the long-term rainfall data at Yaamba [BoM Station 33076]) averages are greater than 100 mm during the wet summer season, while in winter, dry season rainfall averages are less than 50 mm monthly.

The area is within the cyclone risk zone and is subject to summer thunderstorms.

Table 2-2. Monthly Rainfall (mm) (BoM Yaamba Station - 33076)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	143.5	154.4	109.1	57.5	43.2	42.7	35.1	22.4	24.2	43.3	61.8	110.9	842.1
Lowest	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	292.4
Highest	910.2	880.3	507.0	539.2	335.8	234.1	363.6	137.0	170.0	229.9	228.9	727.2	2002.4

2.3.3.2 Evaporation

The mean monthly evaporation (Rockhampton Aero, BoM Station 039083) ranges from a maximum of around 220 mm/month in the summer months to a minimum of around 118 mm/month in the winter months. Total average annual evaporation (around 2,120 mm) is considerably higher than average annual rainfall, and on average evaporation rates exceed rainfall rates in every month of the year.

Table 2-3. Mean monthly evaporation (mm) (BoM Rockhampton Aero Station 39083)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
229	189	195	159	130	105	112	136	174	214	228	242	2119

2.3.3.3 Temperature

Temperatures in the Project region are characteristic of a sub-tropical climate, with cool winters and hot summers. Data from Rockhampton is consistent with this trend with air temperatures low in the winter months and progressively increasing into spring.

The coolest temperatures are typically recorded in July and the warmest in December and January. Mean minimum and maximum temperatures range from lows in winter of 9.7°C to 11.1°C and highs in summer of 31.4°C to 32.2°C (BoM Rockhampton Aero Station 039083).

Table 2-4. Mean maximum and minimum temperature (°C) (BoM Rockhampton Aero Station 39083)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max	32.0	31.4	30.6	28.8	26.1	23.6	23.3	24.9	27.5	29.7	31.3	32.2
Min	22.2	22.2	20.9	18.0	14.3	11.1	9.7	10.8	13.8	17.2	19.6	21.3

2.3.3.4 Long term projections

The Intergovernmental Panel on Climate Change (IPCC) technical definition of climate change is: 'any change in climate over time, whether due to natural variability or because of human activity' (IPCC 2014). Temperatures are predicted to rise, and climate extremes are predicted to amplify with the continued release of GHGs in Australia (CSIRO 2016). The projections are discussed in more detail below.

The preparedness of the Project for climate change depends on adaptation planning for a range of climate change effects including severe droughts, conflict over water use, heatwaves and intense rainfall.

Temperature

There is very high confidence that temperatures in Queensland will rise over the next century (CSIRO 2015). On average, Queensland temperatures have risen by approximately 1°C higher than they were 100 years ago and it is anticipated that temperatures could rise anywhere between 2.9 to 3.9°C by 2070 under a high emissions scenario.

By 2030 the annually averaged warming is projected to be between 0.4 and 1.5°C above the climate of 1986–2005 in Central Queensland. In 2070 under a high emissions scenario, temperature in the Central Queensland region is projected to rise by 2.9°C (1.8 to 3.8°C). By late in the century (2090), the average projected warming in the East Coast cluster (Natural Resource Management regions in the central part of the eastern seaboard of Australia) is 2.7 to 4.7 °C for a high emission scenario, or 1.3 to 2.5 °C under an intermediate emission scenario (CSIRO 2015). There is likely to be a substantial increase in the temperature reached on the hottest days, and an increase in the

frequency of hot days and the duration of warm spells. There is very high confidence that there will be up to two to three times the average number of days above 35°C under intermediate emission scenarios by late in the century (CSIRO 2015).

Rainfall

Australia has been experiencing an increase in extreme rainy days (greater than the 90th percentile for 24 hour rainfall) since the 1970s. However, by 2030, annual rainfall is projected to decrease by up to 3% under a high emission scenario. By 2050, under the high emissions scenario, annual rainfall is expected to decrease by 7% (-59 mm). Rainfall projections for 2070 show little change or a decrease, particularly in winter and spring. The frequency or intensity of high rainfall events is likely to increase (CSIRO, 2015).

Winds and Cyclones

It is projected that there will be a southern shift in the primary region of cyclone activity. Given the location of the Project, greater cyclonic impacts may be experienced. Wind predictions for the Project location estimates an annual increase in wind intensity of 2 to 5% (CSIRO, 2015).

2.3.4 Geological Setting

2.3.4.1 Regional Geology

Regional geology is shown in Figure 2-8. The area is highly mineralised with the nickel/cobalt ore body associated with the Brolga and Canoona sites shown in green, and the Canoona Gold Field in blue splitting the deposit. Magnesite mines are located to the east with a chrysoprase mine located in the west of the ore body.

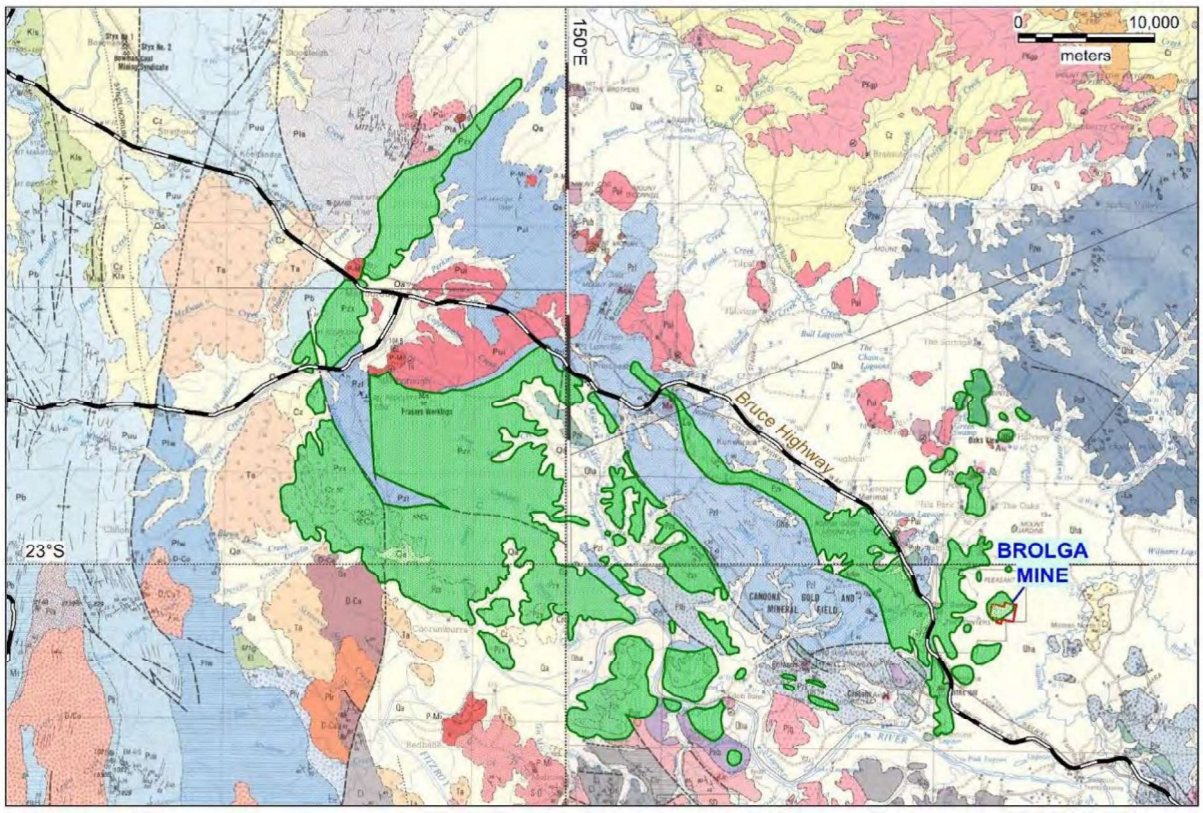


Figure 2-8. Geological Map of the Princhester Serpentinite

The Marlborough Block is a sliver (approximately 3 km thick) of serpentinised harzburgite ophiolite that dominates the landscape of the Marlborough district, forming a series of raised ridgelines with the surrounding granites and volcanics as flat low valleys (Bruce et al. 1998, Korsch et al. 1997).

The rock is now covered by a thick weathering profile containing economic enrichments of nickel, cobalt and chrysoprase. Chrysoprase is a semiprecious quartz rich gemstone being mined by Gumigil Pty Ltd. for jewellery and other items. The groundwaters that flow out of the serpentinite hills are supersaturated with magnesium.

A nickel-cobalt laterite is a weathered rock or soil that has been enriched in nickel and cobalt by the actions of leaching and re-precipitation. Nearly all laterites are of rusty-red coloration, because of high iron oxide content. They develop by intensive and prolonged weathering of the underlying parent rock (Parianos 2017).

2.3.4.2 Brolga (ML5866)

The Brolga deposit is a nickel enriched laterite, formed on the serpentinised peridotites of the Marlborough Block. Nickel laterite deposits are formed by groundwater leaching soluble minerals and elements from the peridotite, then re-precipitating them elsewhere, usually lower, in the rock mass. The nickel-sulphide of the serpentinite is dissolved from the red-brown upper layer of laterite, and is re-precipitated beneath it in the pale-coloured saprolitic laterite layer. The nickel re-precipitates as a nickel-oxide or nickel-silicate. Silica and magnesium also dissolve and re-precipitate in this manner. The extent of the serpentinite and the Marlborough Block are illustrated in Figure 2-9.

2.3.4.3 Canoona (ML5864)

The Canoona site comprises a direct extension from the nearby Pointer Range serpentinite, comprising serpentinised harzburgite and minor dunite; minor lherzolite, pyroxenite, altered gabbro and dolerite, chromitite. Surficial geology is similar to the Brolga site, comprising laterite and silica cap rock and rubble, along with serpentinite and saprolite.

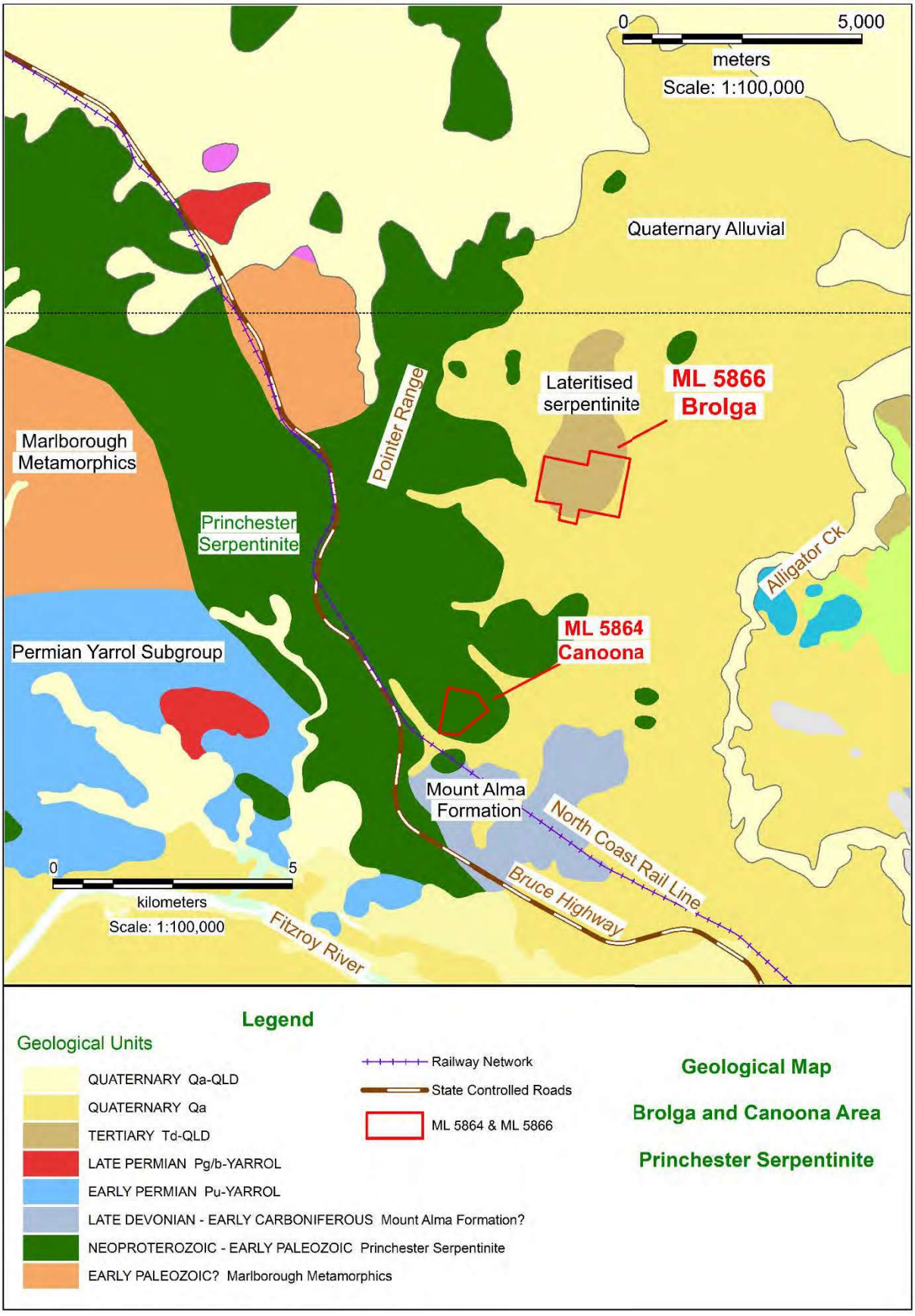


Figure 2-9. Brolga and Canoona Region Geological Map

2.3.5 Water Resources

2.3.5.1 Site Hydrology and Fluvial Networks

The EA is located within the Fitzroy River sub-basin (eastern tributaries) in the Fitzroy River catchment (Figure 2-10). Both MLs are on low hills surrounded by flat Quaternary alluvial plains, and drainage generally radiates from the centre of each site to the perimeter.

The long term yearly mean rainfall is 842 mm (Yaamba Station 33076), and mean annual evaporation rate 2,120 mm (Rockhampton Aero Station 39083). Evaporation rate at both sites is probably marginally higher than this figure, due to the increased distance from the coastline and consequently lower humidity. Long term yearly mean runoff is 122 mm (Figure 2-11), although rainfall and runoff are highly variable. Despite most years having small to moderate runoffs, a significant number of years have high runoff rates - over 200 mm in very wet years.

Brolga (ML5866)

At the Brolga mine site (ML5866) contour banks constructed by the mine and neighbouring farmers – both in the lease and in off lease areas - direct water to dams around the lease area. Run-off from the nearby Pointer Range drains eastward along waterways located immediately south of the Brolga hill, to the low country east of Brolga, designated as stream order 1, 2 and (immediately south of the ML) order 3 streams, mapped as un-named 'Minor', 'Non-perennial' watercourses. These have been modified by the construction of agricultural contour banks and dams. Due to these contour banks and impoundments and limited flow throughout the year, no continuous watercourse is identified from the ML to Alligator Creek to the east.

The local pattern of drainage is shown in Figure 2-12.

The site has four water dams (Dams 1 – 4), of which Dam 4 is the only one located within the ML. Dams 1 and 2 are located near the entrance to the property in the east, Dam 3 is near the south-eastern corner and Dam 4 is near the north-eastern corner. Dam 1 formerly supplied the mining operations water requirements. Dams 3 and 4 function as sediment control structures in association with existing stormwater diversion drains / banks. These structures will be maintained in order to capture and control sediment movement from the site. All four dams have been assessed as having a hazard category of 'low consequence category for failure to contain' in accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (EM365).

Anecdotally, the only open pit to hold water is Pit 1, which is confirmed by satellite imagery over the past several years. Catchment areas shown in Figure 2-12 show that only Dam 4 has significant disturbed areas in its catchment. Dam 3 has relatively minor cleared areas, while the other 2 dams are largely vegetated.

Canoona (ML5864)

Run-off from the Canoona site (ML5864) generally radiates from the centre to the perimeter and appears to soak into the surrounding Quaternary alluvium. Gullies are formed in the base of the hill, but not in the surrounding plains. As for the Brolga site, no defined channels are mapped or observed from the site towards any of the surrounding perennial watercourses.

The local drainage is shown in Figure 2-13.

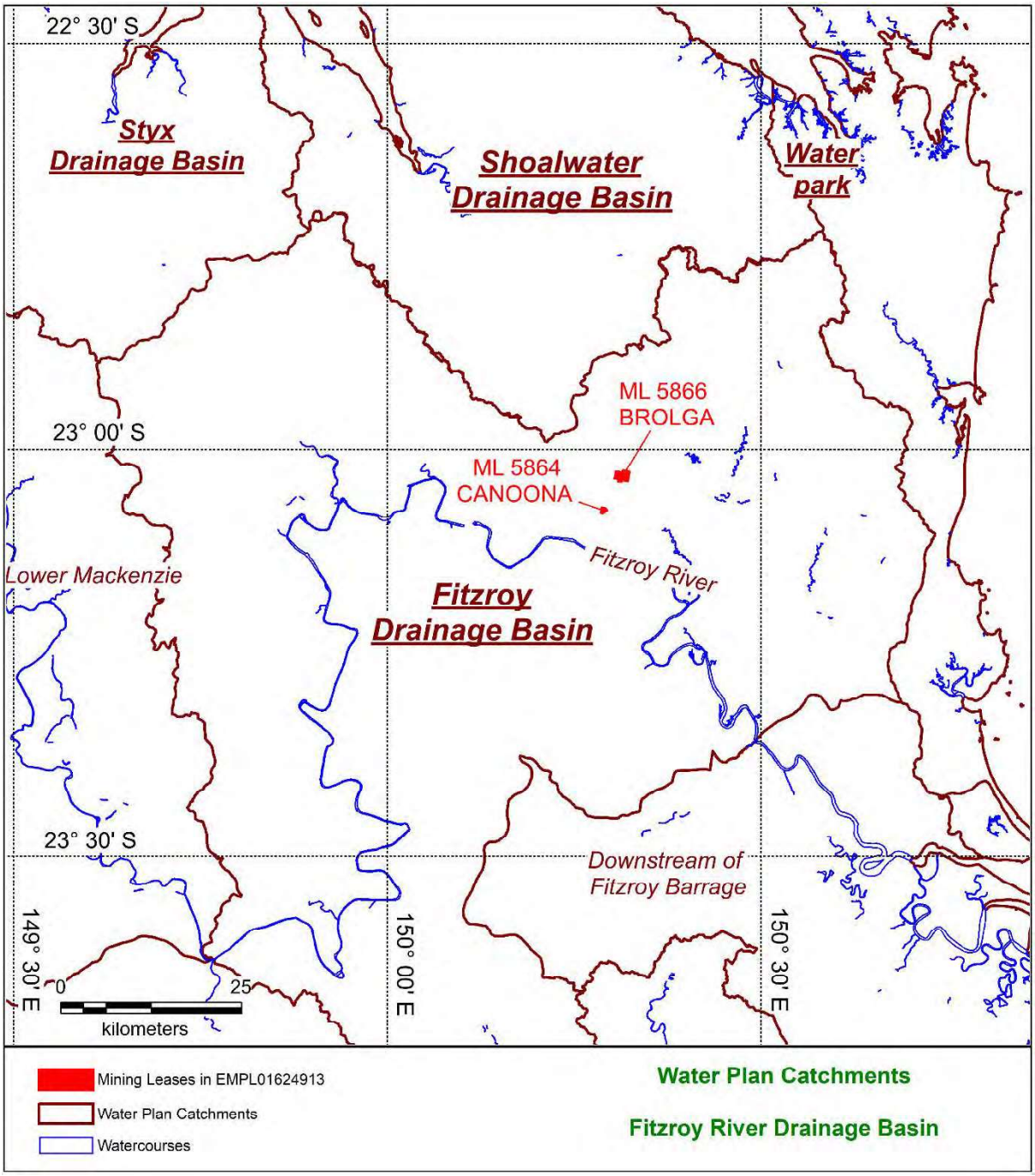


Figure 2-10. Fitzroy Sub-basin

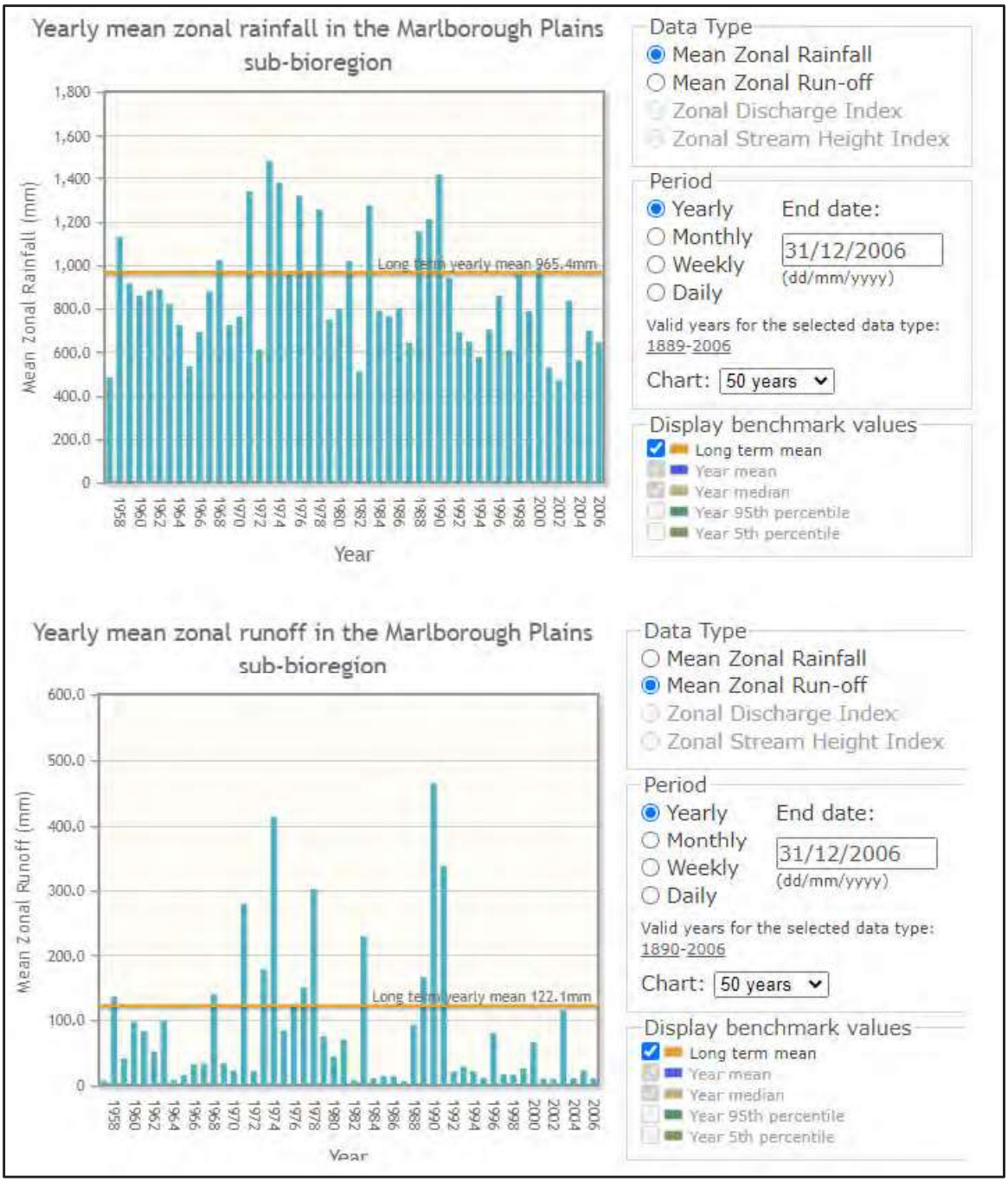


Figure 2-11. Yearly mean zonal rainfall and runoff in the Marlborough Plains sub-bioregion

Source: https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/biogeographic-subregion-marlborough-plains/



Figure 2-12. Local Drainage Pattern ML5866 Brolga

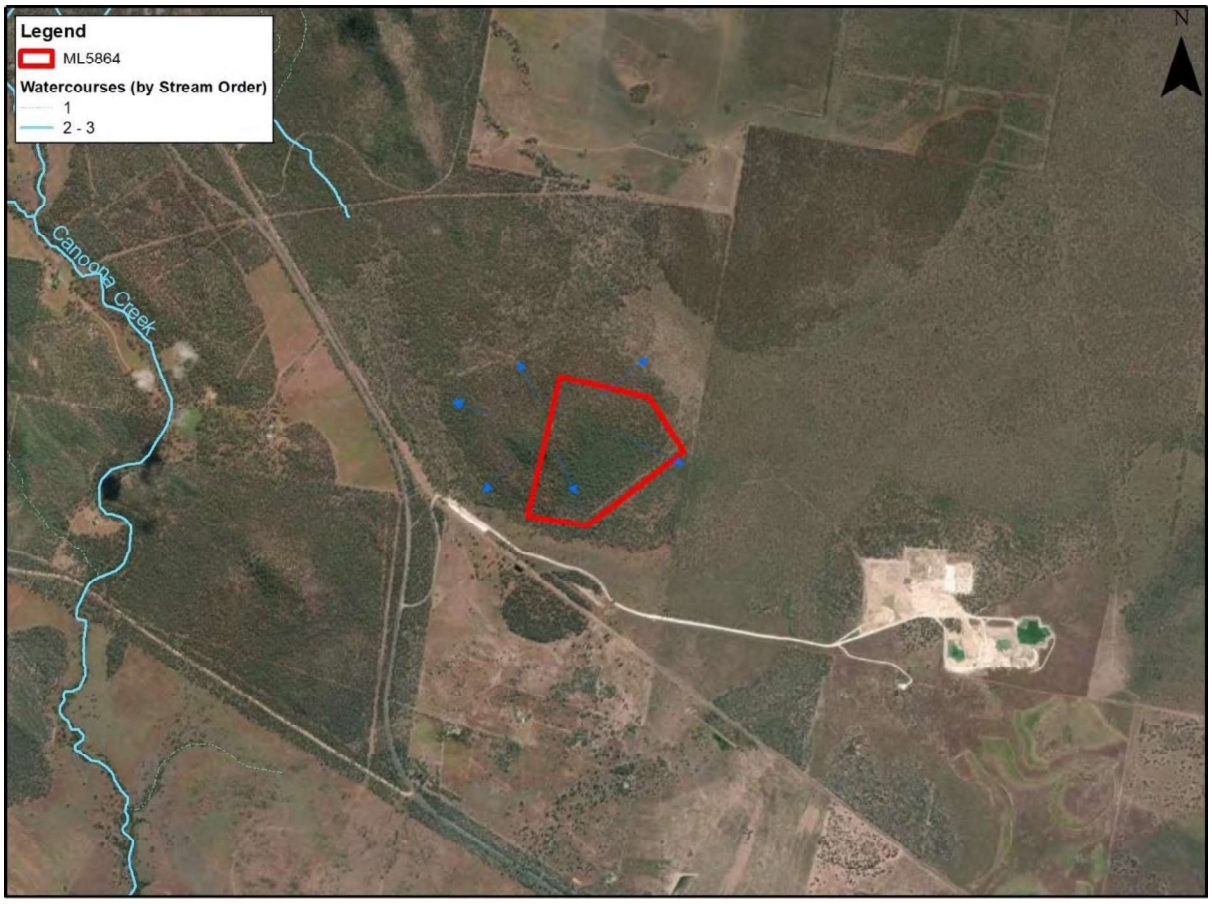


Figure 2-13. Local Drainage Pattern ML5864 Canoona

2.3.5.2 Flooding

The April 2017 Fitzroy River flood peaked at 16.1 metres at Yaamba. The extents of this flood event are shown in Figure 2-14 and are available from the Queensland Government QSpatial website (Flood extent polygon - April 2017 - Connors Fitzroy Isaac and Mackenzie Rivers).

Other major flood events of the Fitzroy River since January 1918 are listed in Table 2-5 with the flood peak levels from Yaamba. Six have exceeded 'Major flood level' (16.0 metres).

Table 2-5. Flood Events measured at Yaamba since 1859

Flood Event	Yaamba (m)
Jan-1918	17.32
Feb-1954	16.59
Feb-1978	14.75
May-1983	14.97
Jan-1991	16.65
Jan-2008	14.25
Mar-2010	10.73
Jan-2011	16.55
Mar-2012	13.50
Feb-2013	15.70
Apr-2017	16.10

Sources: http://www.bom.gov.au/qld/flood/brochures/fitzroy/fitzroy.shtml; https://riverhealth.org.au/report_card/additional-info/floods#site-fitzroy

Basin Level Flood Modelling mapping from the Queensland Government 'floodcheck' website[2] show that the 1% AEP reaches the base of the Brolga hill, flooding the low flat areas around Brolga, but does not intrude into any of the site infrastructure or pit areas (Figure 2-15). The extreme flood event is mapped over the low areas of the Brolga mine, including Pit 8, Pit 5, the Screening Stockpile and Topsoil Dumps 2, 3 and 6 (Figure 2-16). The 1% AEP event is outside of the Canoona ML boundary, flooding the surrounding low lying areas (Figure 2-15), and intrudes into the southern and eastern sides of the ML in the extreme flood event (Figure 2-16), although no infrastructure exists on the site.

The flood levels demonstrate that in major flood events, flooding is likely to occur on the peripheries of ML5866 and ML5864. The lowest parts of ML5866 and ML5864 are approximately 18 metres above sea level. Flood levels would have to exceed approximately 22 metres at Yaamba to enter any pit void that may be open in the Brolga ML.

While the extreme flood event modelled (based on probable maximum precipitation) does not represent the 0.1% AEP event (defining a floodplain for the purposes of a PRCP under the EP Regulation, s41C), and the basin level modelling is necessarily coarse scaled, it has been presumed that Pits 5 and 8 would be situated in the floodplain (as defined by the EP Regulation). In accordance with section 126D(3) of the EP Act, if land which is the subject of the proposed PRCP schedule will contain a void situated wholly or partly in a flood plain, the schedule must provide for the rehabilitation of the land to a stable condition. Section 6.3.3 explains the assessment that has been undertaken to demonstrate that the final voids will be stable. Note that post-rehabilitation, no topsoil dumps would remain, and the Screening Stockpile would be rehabilitated, and would not form a void.

[2] https://floodcheck.information.qld.gov.au/mobile.html

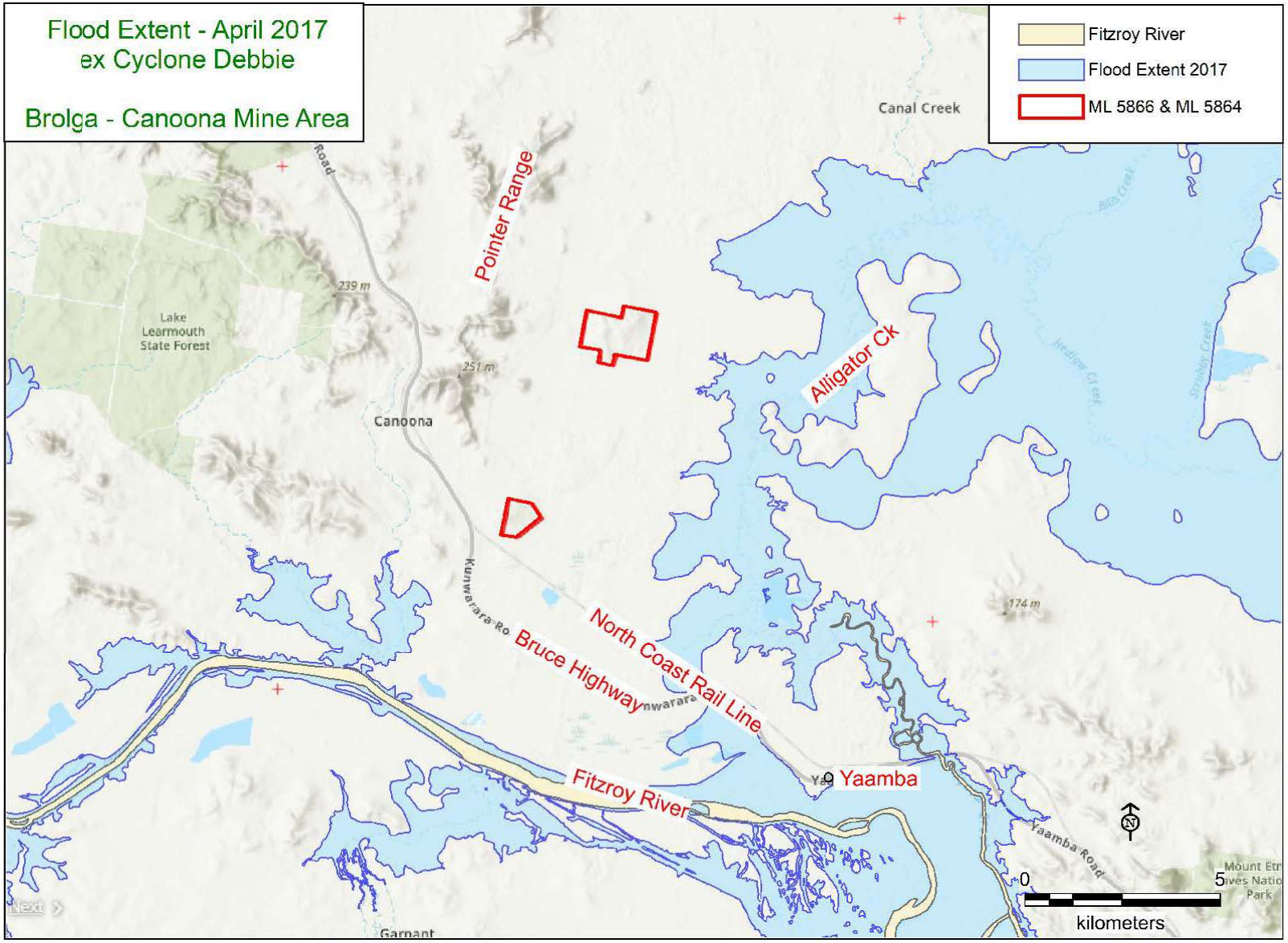


Figure 2-14. Flood Maximum Extent 2017

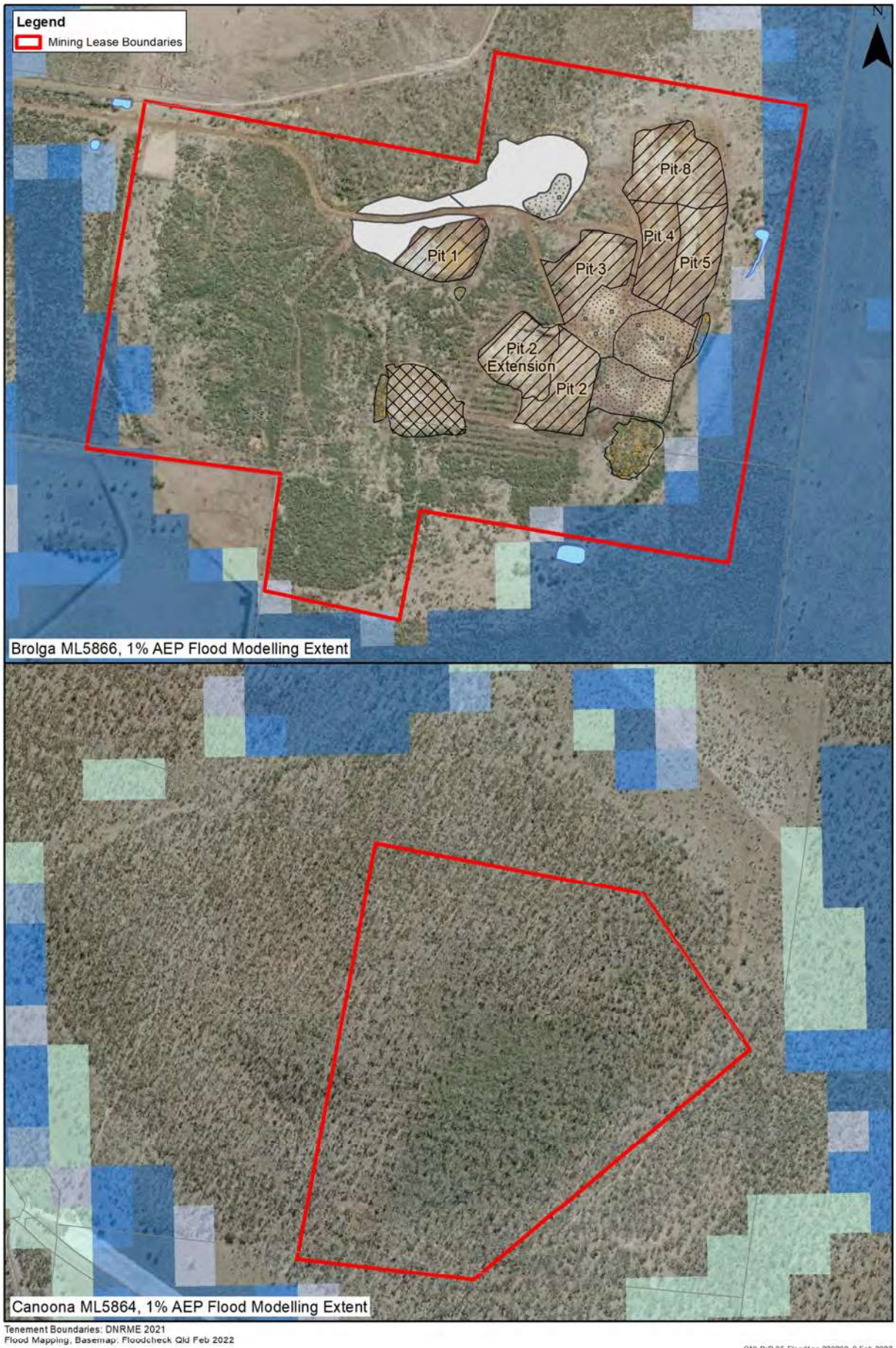


Figure 2-15. Fitzroy Basin Flood Modelling – 1% AEP

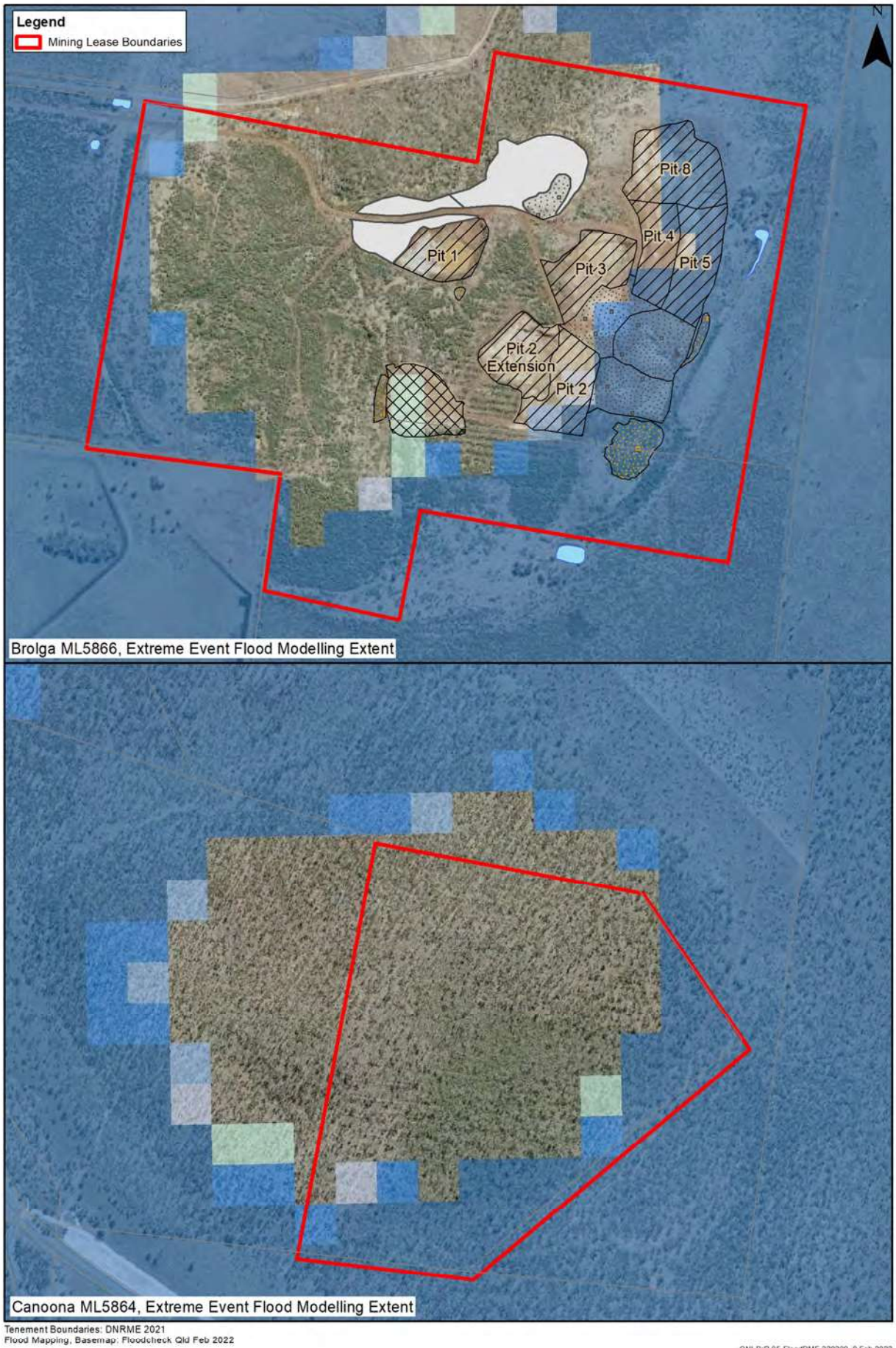


Figure 2-16. Fitzroy Basin Flood Modelling –Extreme Event

2.3.5.3 Groundwater

The MLs are located within the Prospect-Fitzroy groundwater zone (scheduled under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 – DEHP, 2013). However, newer draft groundwater chemistry zones have been developed (McNeil et al, 2018), which maps the MLs occurring over three groundwater systems:

- Fitzroy Serpentinite Belt Alluvium
- Eastern Weathered Cainozoic Remnants, and
- Serpentinite Belt Fractured Rock.

No groundwater dependent ecosystems are mapped in the vicinity of either site.

Brolga (ML5866)

The Brolga site (ML5866) has four groundwater bores installed, with two in operation for some time (Bore 1 (BB1) and 2 (BB2)), and two more (QNWB4 and 5) installed in December 2021 (refer Figure 2-17). An investigation into the groundwater systems on the site was undertaken, including the installation of these latter two bores, an assessment of groundwater location and availability, and a water quality assessment (refer Appendix 4). This found groundwater at approximately 14mAHD, with a slight (~0.4%) grade to the east, well below the mining areas on the site (~50m below Pit 1 and 10m below Pit 2). No groundwater was identified in the upper laterite but was identified in lower fractured rock systems.

Based on the geology and observations during drilling, as well as from mining operations, groundwater is confirmed to be below all infrastructure areas and pits, but some lateral interflow appears to occur related to recent rainfall through the upper laterite layers where pits intersect these areas.

A simplified conceptual model is shown in Figure 2-18 , identifying the above key features.

Groundwater is not expected to recharge to any surface water features either on or off-site. Rainfall falling on the laterite areas is likely to either drain away as surface drainage or soak in, to drain laterally towards the Quaternary alluvial plains. Where pits intercept this layer, this interflow may end up in open pits. Since Pit 1 holds water (more or less permanently), while the others do not, it is considered likely there is some leakage from at least some of the pits into the underlying geology where cracks and fissures exist. However, the evidence suggests this would also flow laterally at boundaries to lower permeability rock, and downward recharge is likely to be, at best, very slow.

Canoona (ML5864)

No groundwater bores are located on the Canoona site (ML5864), and the geology is mapped as the Princhester Serpentinite (a continuous feature with nearby Pointer Range), rather than the ferricrete type structure for Brolga. However, given the proximity of the sites, and the nature of the geology (both serpentinite related ores), groundwater would be expected to be similar, existing in fractured rock systems. The nearest bores – RN91314, RN111135 and RN111596 on the floodplain north and south of the site – place the groundwater within serpentinite at around 10m depth, similar to that found at the Brolga site.

As no pits or other structures are situated on the Canoona site (ML5864), and the site is essentially fully vegetated, no groundwater interactions are likely to occur, and limited, if any, recharge would occur over the hill itself. No discharge locations or springs are anticipated, with any lateral throughflow translated into the surrounding floodplain groundwater systems.



Figure 2-17. Groundwater Bores

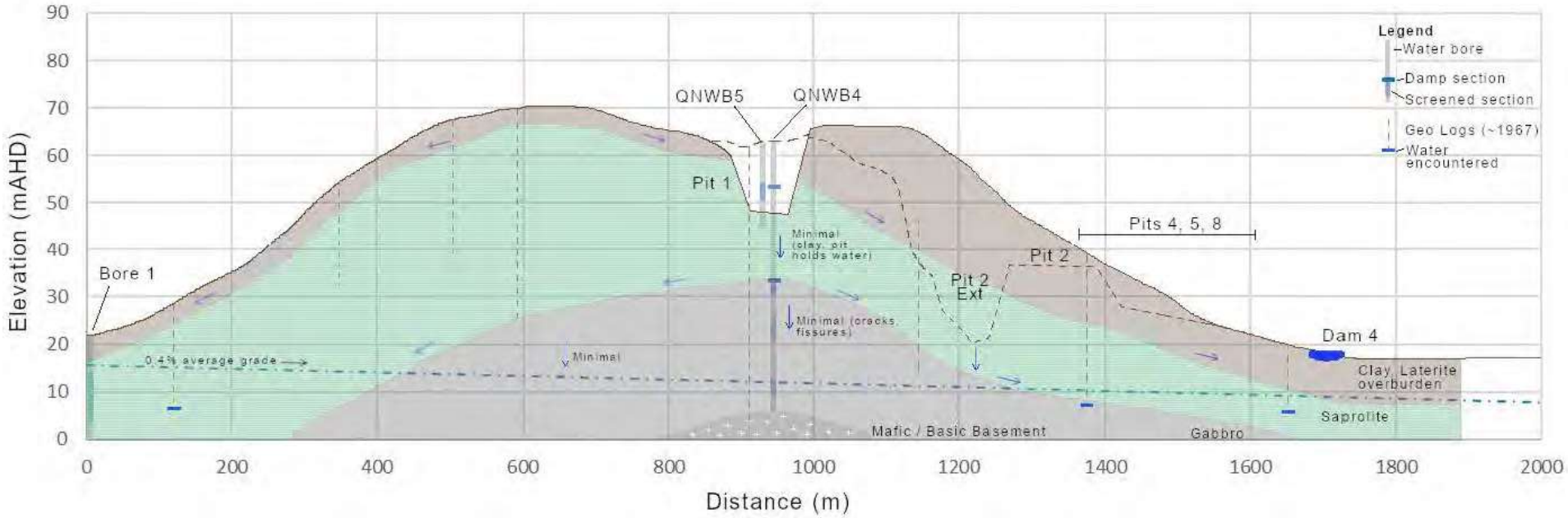


Figure 2-18. Simplified groundwater conceptual model (refer section A-A in Figure 2-17)

2.3.5.4 Water Quality

Canoona (ML5864)

No water quality information is available for the Canoona site (ML5864), although results for the nearby RN111135 bore (located south of the site in the floodplain) are similar to Bore 1 / Bore 2 results from the Brolga site (ML5866), indicating a similar groundwater quality. No surface water structures are in place at the site.

Brolga (ML5866)

As discussed in the water assessment in Appendix 4, the water quality is substantially influenced by the natural geology of the site, with groundwater moderately saline, and surface waters generally fresh. Both surface and groundwaters were dominated by bicarbonate, magnesium and sodium ions, with a neutral pH range, moderate to high hardness, and nitrogen and ammonia were elevated. Metals concentrations reflect the ore body, being enriched in nickel and the associated metals chromium, cobalt and manganese, as well as iron and aluminium. Other studies in the area have found similar associations, indicating these are natural features of the region rather than being an impact from mining activities.

Water quality in the dams meets the water quality criteria set out in Table F2 of the EA. Pit 1 meets the EA water quality criteria for all analytes other than an exceedance for nickel, however the results show that removal of some of the suspended load would reduce levels to within the criteria, and this is expected to occur as the catchment becomes vegetated and stabilised – see below. Groundwater similarly meets the EA criteria for surface waters, with the exception of nickel at QNWB4 (although the EA criteria do not apply to groundwaters).

In general, water for potable or other farm uses may not be ideal (based on salinity, metals concentrations and the potential for precipitates to be deposited over time, resulting in some scaling). The waters all were generally suitable for livestock watering, with some waters (Pit 1 and bore QNWB4) potentially requiring some settlement prior to use (although as noted below, Pit 1 would be expected to improve with stabilisation and revegetation in the catchment). Waters were also moderately suitable for irrigation, although again some waters may require settlement to reduce metals concentrations, with some potential for clogging of irrigation equipment due to iron and manganese (QNWB4, Pit 1).

Groundwater was generally within the draft Water Quality Objectives (WQOs) (McNeil et al, 2018), and given the mineralogy of the area, it is considered likely that groundwater would be naturally affected by the ore deposit (itself formed by dissolution and precipitation reactions within groundwater and geological structures) rather than mining activities.

Exceedances against the WQOs for slightly to moderately disturbed systems (DEHP, 2013) were identified for site dams and Pit 1 water for a number of analytes, including ammonia and total nitrogen, and dissolved metals (arsenic, chromium, cobalt and nickel), although metals exceedances are substantially reduced when receiving water conditions (hardness and background metals concentrations) and the nature of receiving catchments (more highly disturbed, agricultural areas) are taken into account. In particular, serpentinite soils and rocks are known to have elevated concentrations of heavy metals. A study of water quality and metals in sediments within the nearby Marlborough Creek system (Duivenvoorden et al, 2017) showed that the stream sediments were enriched with concentrations of nickel, chromium, cobalt and zinc up to 35, 21, 10 and 2 times the world average for shallow sediments, respectively. Concentrations for nickel and chromium were up

to 60 and 16 times those of the relevant sediment quality guidelines, respectively (Duivenvoorden et al, 2017).

Results for total and dissolved metals show that the bulk of the metals within the surface waters (and groundwater) are bound to suspended solids. Looking at the surface water structures, Dams 3 and 4 and Pit 1 generally have the higher total metals loads. Reference to Figure 2-12 shows that Pit 1, followed by Dam 4, then Dam 3, have the highest disturbed areas of the four dams. Given that the bulk of the metals are bound to sediments in the water column, it is considered very likely that stabilisation and sealing of the catchments would reduce inflow of solids, reducing the overall metals contents in these locations to those more alike to Dams 1 and 2 – i.e. increased vegetation would, unsurprisingly, improve water quality within the site impoundments.

Based on the above, and with the appropriate rehabilitation measures and monitoring, surface waters proposed to remain after rehabilitation would be suitable to support the intended post mining land use of grazing. Groundwaters appear consistent with regional levels, and local enrichment appears consistent with the serpentinite geology of the area. As no groundwater is intercepted and water tables are deep, ongoing management of groundwater during and post rehabilitation is not anticipated to be needed.

2.3.6 Soil Types, Properties and Productivity

In the Land Systems Capricornia (ZDD3) map, both mining leases in EMPL01624913 are within the soil map code 'Tm' (Tungamulli) on the Agricultural Land Class 'C2', meaning 'Pasture Land – Native pastures' (Figure 2-19 and Figure 2-20). Tungamulli is described as 'Shallow, stony black, uniform clays or shallow, stony red, structured gradational clay loams and uniform clays formed on rolling low hills and undulating rises on serpentinite; Eucalypt woodland.'. The dominant 'Soil Order' in the immediate area is mapped as 'Vertosol'.

Lateritic soils are residual soils, the remnants left after weathering has dissolved and removed other mineral and chemical constituents. The mineralogical composition of the soil is mainly iron- and aluminium-oxides, iron- and aluminium hydroxides, quartz, kaolinite and chalcedony. Some peds associated with the lower topographic areas appear to contain a minor proportion of smectite clay.

The topsoil contains a dark red-brown mixture of small stony fragments, quartz and chalcedony with a variable clay content. The degree to which these soils bind into clods, pisolites, aggregates and concretions varies depending upon the moisture and clay contents, which in turn is often a result of its origin in the topographic sense. The soil from the higher topographic areas contains proportionally less clay, while soils taken from lower areas contain a higher proportion of clay, presumably as a result of sediment transport during rain.

Being located on a lateritic regolith profile, the upper soil horizons are not distinguishable. There is no distinctive A0 Horizon or any significant organic enrichment. The 'A' soil horizon, which is the laterite ferricrete layer, is usually thick and highly variable in thickness, up to about three metres.

The stony fragments in the soil are concretions of iron- and aluminium-oxides (haematite, goethite, gibbsite), with grains of quartz and chalcedony also bound in the concretions.

The manner in which the soil binds is mainly due to the proportions of the various minerals and the moisture content. Moisture content greatly affects lateritic soil's ability to form concretions and aggregate lumps. Clay also affects this tendency to aggregate.

The moisture content has a substantial effect on the soil binding properties. The moist soil has pre-existing concretions with weaker binding strength, due to the binding minerals becoming somewhat dissolved by the additional moisture. Dry soil, especially where there is a low clay content, aggregates into relatively strong concretions, which are not readily pulverized by machinery or hand.

The soil from the higher topographic areas contains proportionally less clay, resulting in it having a tendency to aggregate into the hard concretions typical of laterites. This occurs due to the dissolution and re-precipitation of iron- and aluminium-hydroxides, which bind the particles of quartz, chalcedony and existing iron- and aluminium-oxides into pisolites and irregularly shaped concretions.

Kaolinite is known to inhibit the binding/concretion process. The soil found on the lower slopes contains a higher proportion of clay (kaolinite) within which some fine concretions can be felt. Where the soil contains a significant kaolinite content, the binding processes that result in a visibly 'gravelly' soil are less likely to occur.

Although most of this clay on the lower areas is probably kaolinite, some of it must be smectite clay, because these soils have a distinctive plasticity. Kaolinite, although a clay, does not have exceptional plasticity, whereas smectite has a high plasticity. Despite the clay content, the soil does not tend to crack after drying.

A Livingstone Shire cadastral survey plan, dated 7th February 1913, of the land parcels where the Brolga Mine is located, noted soil on the mine area as "Brown gravelly soil", "gravelly Ironstone soil", "Rich red soil", "soil gravelly in places", "Red brown soil but rather stony" and "Rich chocolate soil."

The topsoil reflects the mineralisation of the area and has maintained the surrounding natural vegetation and pastures. The local flora is specialised as a vegetation community specific to soils formed on a serpentinite parent rock, adapted to the local mineralized environment.

The graders and bulldozers that scraped the topsoil attempted to scrape about 10 centimetres from the top of the soil profile. The irregular surface and variable soil properties resulted in a variable thickness of topsoil that was gathered to the topsoil dumps. It is estimated that the topsoil dumps include between 5 – 15 centimetres of soil that was scraped from the surface prior to overburden excavation. Assessments to ascertain any amelioration requirements of the stockpiled topsoil will be undertaken prior to use in rehabilitation activities.



Figure 2-19. Soil Mapping ML 5866

Source: the Queensland Spatial Catalogue

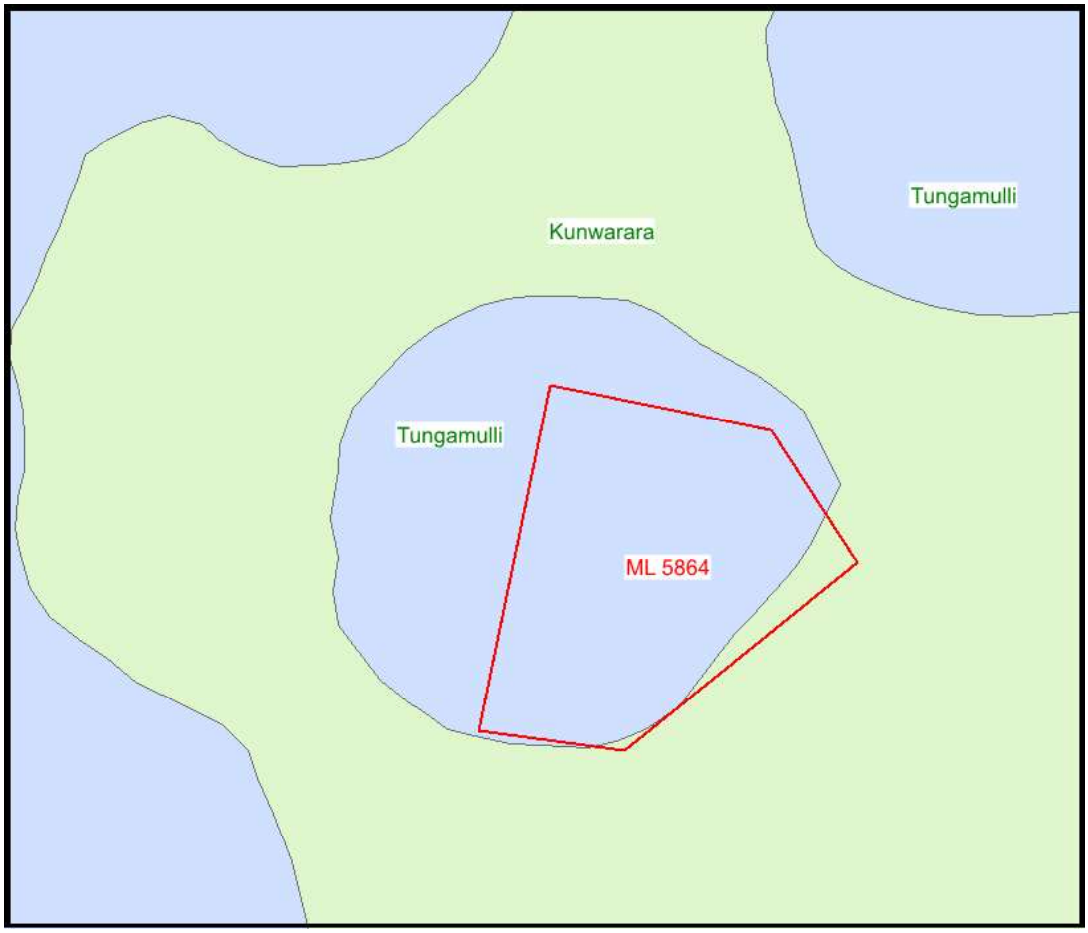


Figure 2-20. Soil Mapping ML 5864

2.3.7 Residue Geochemical Characteristics

The region's geology, ore body formation, Gladstone Nickel Project SEIS static testing (see below), regional water quality data and site rehabilitation performance following 28 years of mining on Brolga have been used to understand the geochemical characteristics of the residual material, in particular, with a view to understanding whether Acid Rock Drainage (ARD) is present. ARD typically limits plant growth due to the low pH and high salinity generated by the oxidation of pyritic mine waste, so it is critical to rehabilitation activities to understand whether it is present. A full explanation of the analyses is given below.

The Gladstone Nickel Project (GNP) consists of a proposed Nickel refinery with supporting facilities to be located at Gladstone, Queensland. The refinery will process ores from a nickel laterite mine which is part of the Ni/Co ore body that contains the Brolga mine and its resources, together with nickel laterite ores imported from the south-west Pacific region. Therefore, the Geochemical Characterisation Assessment undertaken for the GNP is directly relevant to the Brolga Project, and has been used to inform assessments of geochemistry. Figure 2-21 shows the location of Brolga Project in relation to the GNP and the Ni/Co ore body.

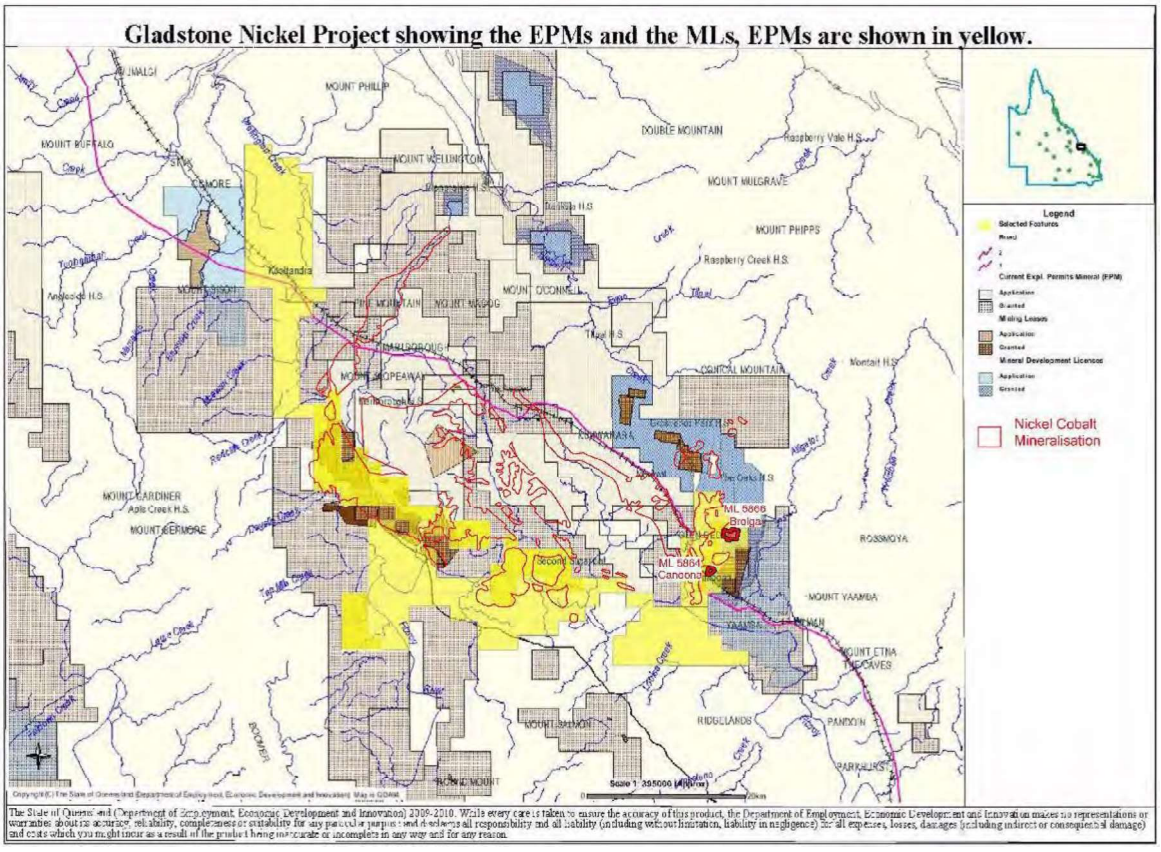


Figure 2-21. Location of Brolga Project relative to the Gladstone Pacific Nickel Project tenements

Laboratory analyses of leachate from the Waste Rock Dump and the Nontronite Stockpile using the Australian Standard Leaching Procedure (ASLP) water leach are shown in Table 2-6, below. Twenty sites were sampled in the Nontronite Stockpile and the Waste Rock Dump. The profile from 0 to 50 cm was collected and samples combined in a drum and mixed to make a representative sample. This was then poured through the site's splitter box until the desired shipping weight was obtained.

The electrical conductivity (EC) and salinity are representative of low salinity soils (Qld Government Salinity Management Handbook, Chapter 9 - Soils) and the pH is representative of the regional

alkaline sodic soils. The Gladstone Nickel Project SEIS Residue Geochemical Characterisation Assessment (Attached as Appendix 9 of this PRCP) states that the ore body has a pH of 7.6 and an electrical conductivity (µS/cm) of 650. This is consistent with the recorded EC for the leachate - refer to Appendix 10 to see the full set of results.

Table 2-6. Leachate from Waste Rock Dump and Nontronite Stockpile - Acid Rock Drainage Potential

Analyte	Unit	Nontronite Ore	Waste Rock
Al	mg/L	1.54	0.12
As	mg/L	<0.01	<0.01
B	mg/L	0.3	0.2
Cd	mg/L	<0.005	<0.005
Cr	mg/L	0.62	0.43
Co	mg/L	0.05	0.07
Cu	mg/L	<0.01	<0.01
Pb	mg/L	<0.01	<0.01
Ni	mg/L	2.97	2.71
Se	mg/L	<0.01	<0.01
Zn	mg/L	0.19	0.12
Mb	mg/L	0.01	<0.01
Hg	mg/L	<0.0001	<0.0001
Electrical Conductivity @ 25°C	µS/cm	150	60
Total Dissolved Solids @180°C	mg/L	123	59
Salinity	g/kg	0.07	0.03
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	13	21
Total Alkalinity as CaCO3	mg/L	13	21
Sulfate as SO4 - Turbidimetric	mg/L	3	1
Chloride	mg/L	38	6
Calcium	mg/L	<1	1
Magnesium	mg/L	1	5
Sodium	mg/L	30	7
Potassium	mg/L	<1	<1
Total Anions	meq/L	1.39	0.61
Total Cations	meq/L	1.39	0.76
Fluoride	mg/L	0.2	0.2
Final pH	pH Unit	7.8	8.5

Geology, scientific literature, site data and site rehabilitation performance are reviewed to quantify the risk of ARD. ARD is only a risk if mining occurs below the Line of Oxidation (LOX). Above this line, oxidation and leaching of the overburden has occurred. The groundwater table is considered a proxy for the LOX line. ARD can be observed in mine waste within 12 months of exposure to oxygen and water. ARD typically limits plant growth due to the low pH and high salinity generated by the oxidation of pyritic mine waste.

The region's geology, ore body formation, Gladstone Nickel EIS static testing, regional water quality data and site rehabilitation performance following 28 years of mining on the mining lease all demonstrate that ARD is not present in the mining horizon or a potential threat with mining. In fact,

the ore has a high Acid Neutralising Capacity (ANC) and is capable of being used to neutralise ARD in other waste (see Section 2.3.7.2 below).

Further explanation of the geochemistry with reference to these factors is given below.

2.3.7.1 Geology

As noted in Section 2.3.4, the regional area is highly mineralised with the Marlborough Block. A sliver (approximately 3 km thick) of serpentinised harzburgite ophiolite that dominates the landscape of the Marlborough district, covered by a thick weathering profile containing economic enrichments of nickel, cobalt and chrysoprase. The groundwaters that flow out of the serpentinite hills are supersaturated with magnesium.

A nickel-cobalt laterite is a weathered rock or soil that has been enriched in nickel and cobalt by the actions of leaching and re-precipitation. Nearly all laterites are of rusty-red coloration, because of high iron oxide content. They develop by intensive and prolonged weathering of the underlying parent rock (Parianos, 2017).

2.3.7.2 Low-grade nickel laterite ores used to treat Acid Mine Drainage

Limestone has been the traditional treatment media used in passive treatment of Acid Mine Drainage (AMD). However, due to some disadvantages, other alternatives of alkaline-generating materials, like serpentinite (Bernier, 2005; Kamal and Sulaiman, 2014) and low-grade nickel laterite ore (Turingan et al, 2020) have been investigated to neutralize AMD.

Turingan et al, 2020 used low grade nickel laterite ores (LGO) characterised by having less than 1.4% Ni to investigate its performance as media for AMD neutralization. Although the performance of LGO as AMD neutraliser in comparison with other materials analysed (limestone, fly ash, and cement waste) was not optimal, it was found that LGO in combination with other materials could help to treat AMD at mine sites.

The sole purpose of including nickel laterite ores and serpentinite ores as alternatives to treat Acid Mine Drainage in different studies around the globe demonstrates that these materials do not pose any risk of having and/or increasing the Acid Mine Drainage at any site.

Brolga mine considered any material with less than 0.8% nickel as waste. This locates Brolga mine inside the low grade nickel laterite ores (LGO) investigated by Turingan et al, 2020. In addition, Serpentinite - which is the type of rock studied by Bernier, 2005 and Kamal and Sulaiman, 2014 - is the ultramafic parent rock of the Marlborough Nickel Laterite deposits and therefore the Brolga Deposit (Foster & Eggleton, 2002).

2.3.7.3 Site data and observations

Since mining commenced in 1993, water quality on site is consistently above neutral, with surface waters (Dams 1 – 4) at around pH 8.0, and groundwaters pH 7.5. Site rehabilitation has been successful with natural colonisation of local species occurring in all disturbed areas with time. No visual evidence has been observed of hostile spoil limiting plant growth on site. Hostile spoil is defined as spoil with low pH, high salinity and/or poor physical characteristics.

2.3.7.4 Geochemical characteristics of ore (from Gladstone Nickel Project Supplementary EIS)

As part of the Supplementary Environmental Impact Statement for the GNP, a geochemical characterisation of the waste material and the ore of the Marlborough ore body was completed (this is included as Appendix 9 of this PRCP).

Table 2-7 shows the results of the geochemical (acid-base) testing of the ores evaluated. Results for the Marlborough ore are summarised below.

- The Marlborough ore sample has a pH (1:5) of 7.6 and have no detectable alkalinity.
- The EC for the Marlborough Ore is 650 uS/cm being classified as non-saline.
- Total sulphur concentration for the Marlborough Ore is low 0.01% with all the sulphur present as sulphate, indicating that almost no sulphur is present in the sulphidic (unoxidised) form.
- The low concentration of oxidisable sulphur in the Marlborough Ore (<0.01%) indicates that the samples are barren and can only generate an insignificant Maximum Potential Acidity (MPA) of approximately 0.3 kg H_2SO_4/t.
- Acid Neutralising Capacity (ANC) of Marlborough Ore is 25 kg H_2SO_4/t.
- As the ANC significantly exceeds the MPA, the Net Acid Producing Potential (NAPP) is strongly negative (-25.2 kg H_2SO_4/t) for Marlborough Ore.
- The Net Acid Generation (NAG) capacity for Marlborough Ore is <0.1 kg H_2SO_4/t with a NAG pH value of 8.3.

The Marlborough ore was classified as Non-Acid Forming (NAF) due to the lack of oxidisable sulphur, a negative NAPP, and NAG pH values above 4.5.

Table 2-7. Geochemical characteristics of the ore

	Units	Laboratory Detection Limit	Residue[6]	Marlborough Ore	New Caledonia Ore
pH[1]	pH units	0.1	7.4	7.6	5.3
Electrical Conductivity (EC)[1]	uS/cm	1	8,630	650	76
Alkalinity (to pH 5.5)[2]	kg H_2SO_4/t	0.0001	0.0021	<0.0001	<0.0001
Acidity (to pH 8.3)[2]	kg H_2SO_4/t	0.0001	0.00012	<0.0001	0.0026
Total Sulfur (as S)	%	0.01	7.66	0.01	0.28
Sulfate Sulfur (as S)[2]	%	0.01	7.34	0.01	0.28
Total Oxidisable Sulfur (TOS)[3]	%	0.01	0.32	<0.01	<0.01
Total Organic Carbon (TOC)	%	0.02	0.08	n/a	n/a
Maximum Potential Acidity (MPA)[4]	kg H_2SO_4/t	0.1	9.7	0.3	0.3
Acid Neutralising Capacity (ANC)	kg H_2SO_4/t	0.5	54.4	25.2	0.6
Net Acid Producing Potential (NAPP)	kg H_2SO_4/t	0.1	-44.7	-25	-0.3
Net Acid Generation (NAG)	kg H_2SO_4/t	0.1	<0.1	<0.1	<0.1
NAGpH	pH units	0.1	8.1	8.3	5.9
Sample Classification[5]			**Non-Acid Forming**	**Non-Acid Forming**	**Non-Acid Forming**

Notes:
1. Natural pH and EC provided for 1:5 sample:water extracts
2. Alkalinity and Acidity converted from meq/kg as $CaCO_3$ to kg H_2SO_4/t. Sulfate sulfur converted from mg/kg SO_4 to % S.
3. TOS concentration is calculated from the difference between total S and sulfate sulfur concentrations. It is assumed that the organic S concentration is negligible.
4. MPA calculated using TOS.
5. Sample has low TOS content, negative NAPP and NAGpH > 4.5 and is therefore classified as Non-Acid Forming (NAF).
6. Residue sample G200 NRS

2.3.8 Land Stability

Land stability is used to refer to larger scale ground movements and the formation of unstable soil or rock masses through either human activity or natural processes. Land instability can lead to damage to built infrastructure, vegetation, natural landforms and farmland and loss of land function.

Both mining leases are situated on topographically elevated features surrounded by Quaternary alluvial sediment. The Brolga site is a lateritised remnant of serpentinite on the south-eastern periphery of the Princhester Serpentinite. During the intense weathering the weathered profiles

became indurated due to the accumulation of secondary minerals within the profile. These characteristics help to stabilise the land and the slopes usually found in these types of rocks.

Based on airphoto research the area in its pre-mining state was used for grazing. The lower slopes and the soils appeared to have favoured the areas for this activity. The same analysis shows that the land in the area is stable in its original form. No signs of ground movements or gully erosion was visually found.

The Livingstone Shire Planning Scheme (2018) OM18 – Landslide Hazard Area mapping identifies both the Brolga and Canoona MLs occupying land where there is no identified landslide hazard (See Figure 2-22).

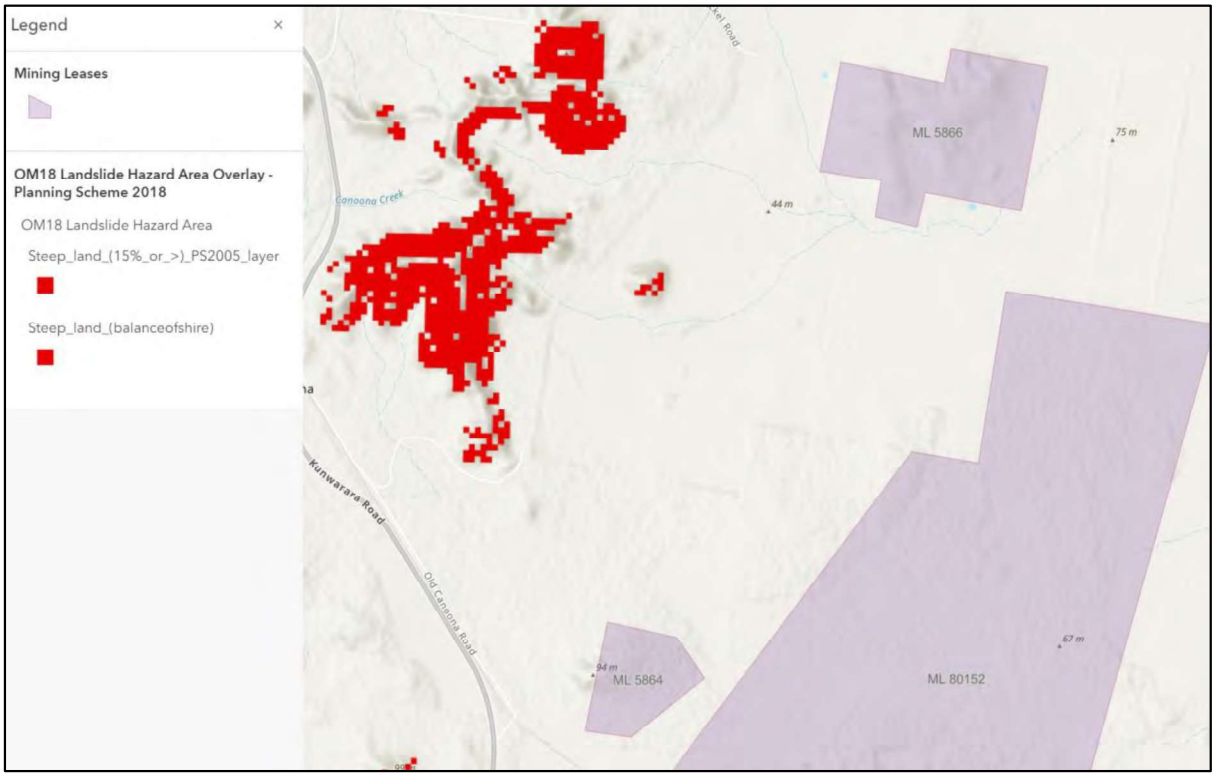


Figure 2-22: Livingstone Shire Landslide Hazard Mapping

2.3.9 Vegetation Communities and Ecological Data

EMPL01624913 is entirely within the 'Brigalow Belt' Bioregion, within Biogeographic subregion 'Marlborough Plains' (Code 11.14). It is within the Fitzroy Basin, Fitzroy River Sub-basin, on the 100K Map Tile 89-51 'Ridgelands' and the 250K Map Tile SF56-13 'Rockhampton'.

The Broad Vegetation Group over both mining leases is "Eucalypt woodlands to open forests".

ML5866 Brolga is mapped under the DES Regional Ecosystem (RE) mapping as containing entirely non-remnant vegetation. ML5864 Canoona is mapped as containing entirely remnant Regional Ecosystem vegetation (Figure 2-23 and Figure 2-24). The vegetation mapping is explained further in Section 2.3.9.1 below.

2.3.9.1 Regional Ecosystems

Brolga

Brolga is mapped as non-remnant vegetation. Its former vegetation is shown on the DES Pre-clearing RE mapping, which identifies the original extent of vegetation communities before anthropogenic

clearing occurred. The mapping identifies the pre-clearing vegetation of Brolga as predominantly RE 11.11.7x1. However, RE 11.3.38/11.3.38a (80/20%) occupied the flat areas surrounding the ML, as well as a small part of the Brolga ML itself, around the southern edges (Figure 2-25; see also Appendix 5 for the full details of the DES mapping).

Canoona

ML5864 Canoona is mapped as being wholly within RE 11.11.7 (Figure 2-26). An ecological assessment undertaken on Canoona in December 2021 found that this RE mapping was correct (see Appendix 6).

Regional Ecosystem descriptions

RE 11.11.7

The short description of RE 11.11.7 is *"Eucalyptus fibrosa subsp. fibrosa, Corymbia xanthope* woodland on serpentinite*"*. It is categorised as "Least Concern" under the *Vegetation Management Act 1999*, and has a Biodiversity Status of "Of concern" and a 'Sparse' Structure category.

Its description was transcribed from the following link;

https://apps.des.qld.gov.au/regional-ecosystems/details/?re=11.11.7

"Complex of vegetation on serpentinite hills and adjacent undulating colluvial aprons dominated by Eucalyptus fibrosa subsp. fibrosa +/- Corymbia xanthope +/- Corymbia spp. A variable shrub layer includes Acacia leptostachya, Hakea trineura, Xanthorrhoea spp. and Macrozamia serpentina. Occurs on steep mountains, undulating low hills and rises and colluvial aprons formed from Permian ultramafic rocks (serpentinite) including remnant lateritised surfaces in more elevated areas. Associated soils are shallow to moderately deep dark stony clays to clay loams. (BVG1M: 13c)"

RE 11.11.7x1

RE 11.11,7x1 is a subcategory of RE 11.11.7 that differs slightly from the main RE. This vegetation community is mapped as the pre-clearing community on the Brolga ML. The description is *"Eucalyptus fibrosa subsp. fibrosa +/- Corymbia spp. tall woodland with rainforest elements in the understorey.*

RE 11.3.38/11.3.38a (80/20%)

The short description of 11.3.38 is *Eucalyptus tereticornis, Melaleuca viridiflora, Corymbia tessellaris* and *Eucalyptus fibrosa* subsp. *fibrosa* woodland with a grassy ground layer on alluvial plains and broad drainage lines derived from serpentinite.

It is categorised as "Least Concern" under the *Vegetation Management Act 1999*, and has a Biodiversity Status of "Endangered". Structure category is 'Sparse'.

Its description was transcribed from the following link;

https://apps.des.qld.gov.au/regional-ecosystems/details/?re=11.3.38

Eucalyptus tereticornis, Corymbia tessellaris, C. dallachiana +/- E. fibrosa subsp. fibrosa, +/- Melaleuca spp. woodland to open forest. Includes areas dominated by Melaleuca bracteata low woodland. The grassy ground layer includes Arundinella nepalensis and Themeda triandra. Occurs on alluvial plains and broad drainage lines overlying magnetite deposits derived from serpentinite. (BVG1M: 16c).

On a small part of, and adjacent to, the Brolga ML, this RE is comprised of a mixed polygon of 80% RE 11.3.38 and 20% RE 11.11.38a. RE 11.3.38a is a subcategory within RE11.3.38 and is described as *"Melaleuca bracteata low woodland. Riverine."*

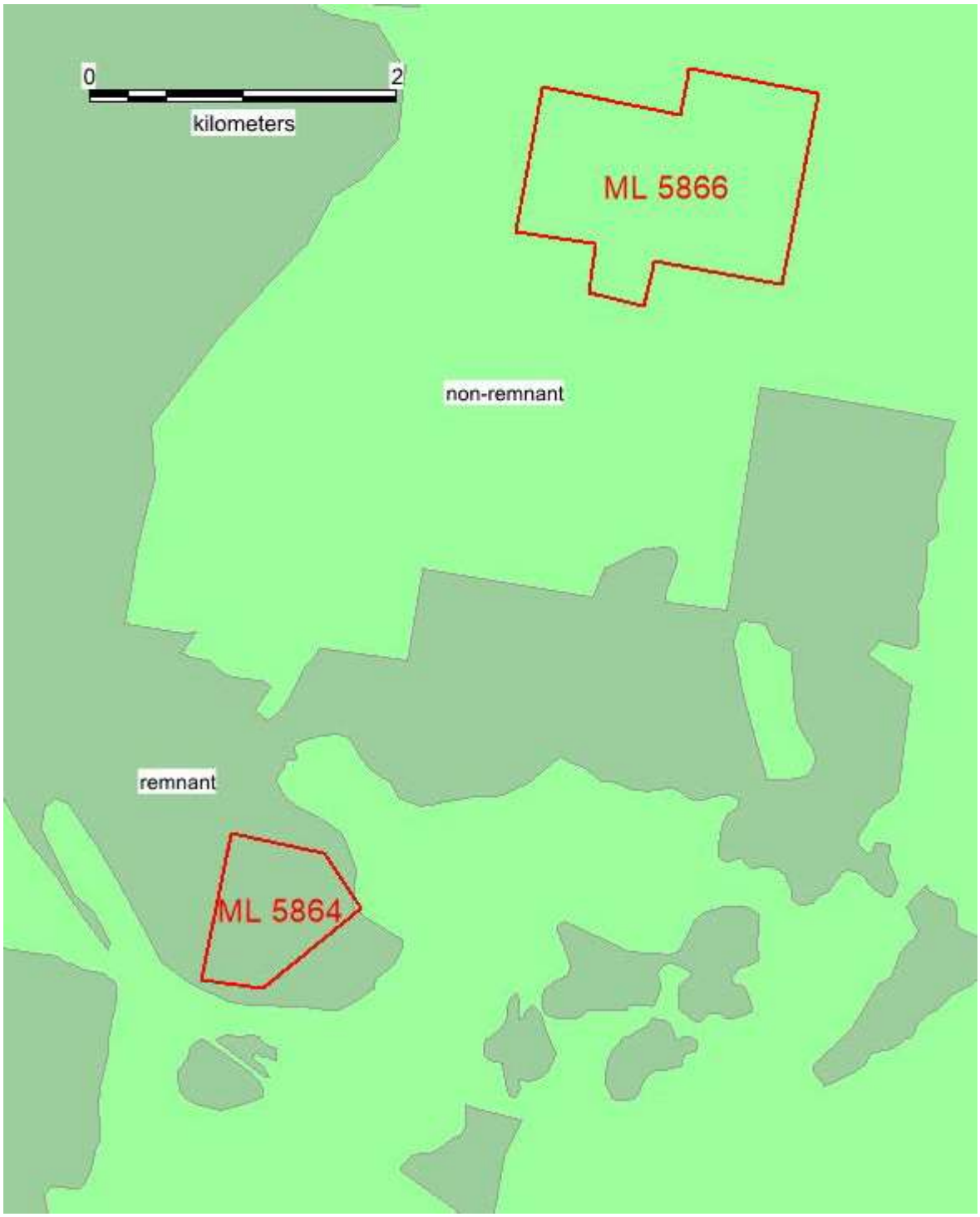


Figure 2-23. Extent of Remnant and non-remnant Vegetation

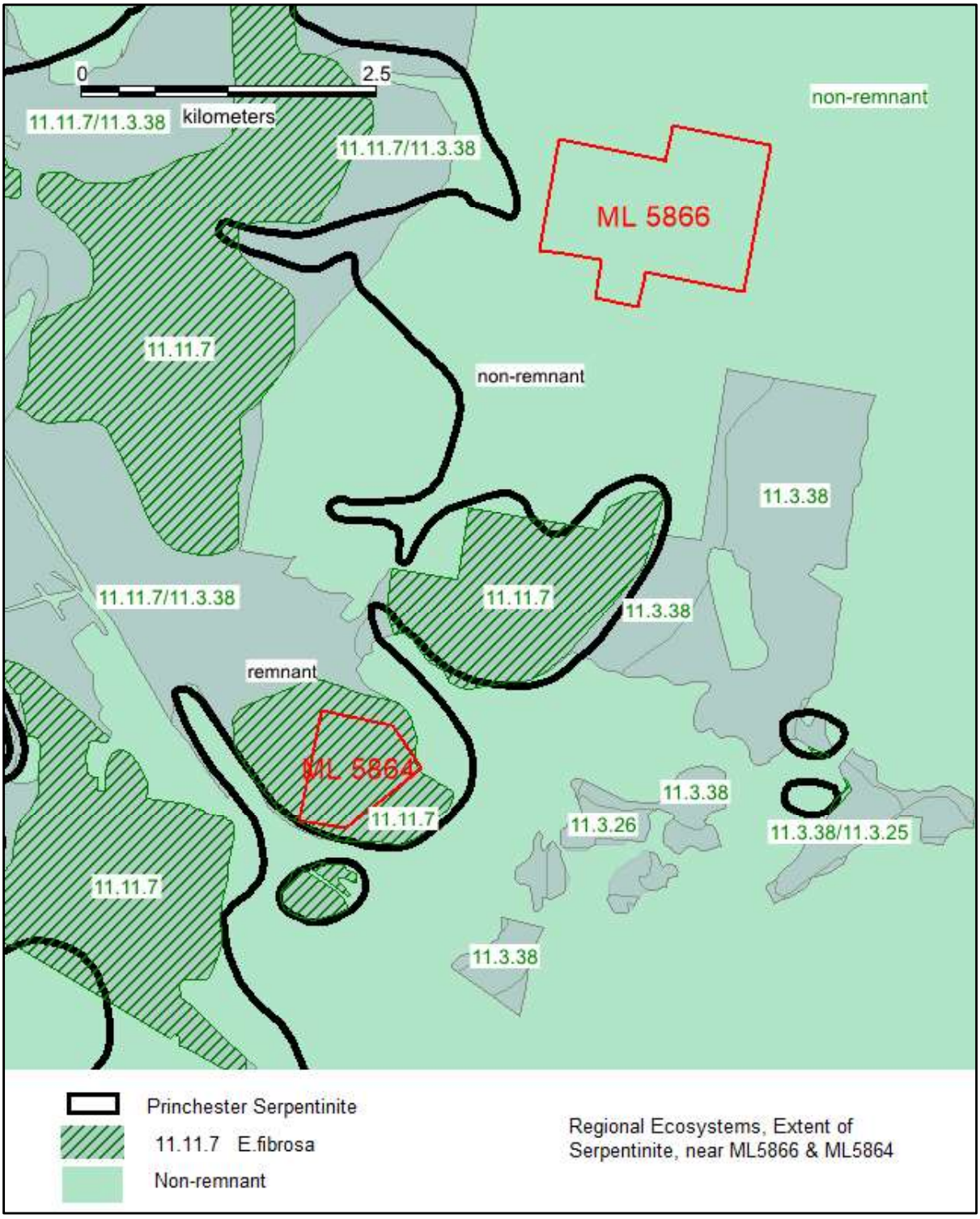


Figure 2-24. Regional Ecosystems and the Princhester Serpentinite

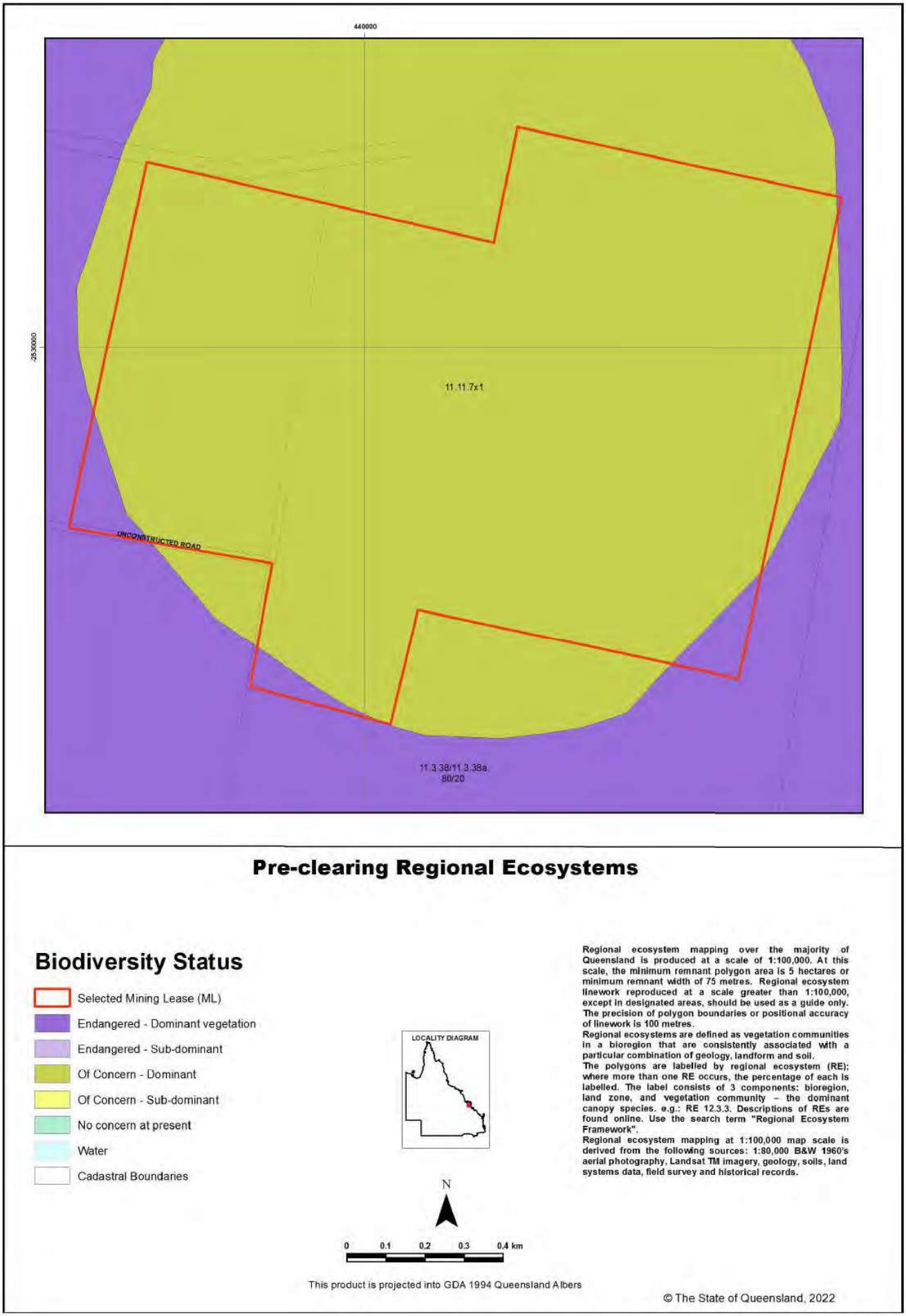


Figure 2-25. Brolga (ML5866) Pre-clearing Regional Ecosystems

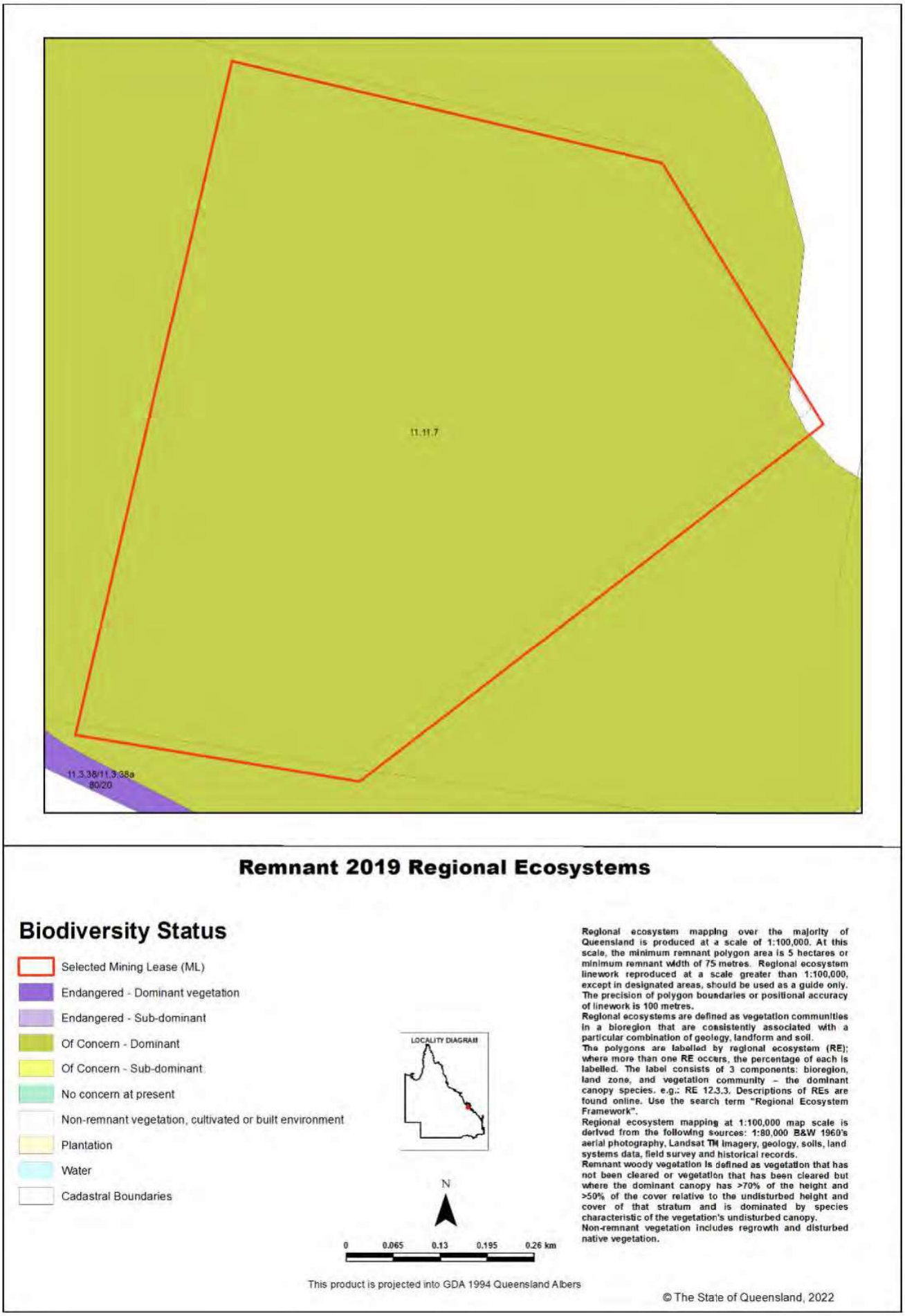


Figure 2-26. Canoona (ML5864) Remnant Regional Ecosystem

2.3.9.2 Biodiversity Significance

The DES attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). For areas identified as having biodiversity values, the BPA assigns three levels of overall biodiversity significance: State, Regional or Local and/or other values.

Brolga

Other than a very small area (0.22 ha) on the edge of the Brolga ML mapped as having local, or other values, the Brolga ML is not mapped as having any Biodiversity Significance under the BPA (see Figure 2-27 with the full details in Appendix 5).

Canoona

The Canoona ML is mapped as having a State level of Biodiversity Significance. Within this categorisation, half of the site is further identified as State Habitat for Endangered, Vulnerable or Near Threatened (EVNT) taxa (see Figure 2-28, with the full details in Appendix 5).

2.3.9.3 Wildlife Corridors

Both MLs are mapped as State Wildlife Corridors.

2.3.9.4 Aquatic conservation significance (riverine wetlands)

Both MLs and surrounds are mapped as having a high aquatic conservation significance (riverine wetlands).

2.3.9.5 Regulated Vegetation – Essential Habitat

Essential Habitat is Regulated Vegetation in which a species that is Endangered or Vulnerable under the *Nature Conservation Act 1992* (NC Act) has been known to occur. Essential habitat is compiled from a combination of species habitat models and buffered records of conservation significant species. Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to one kilometre from a lot on which there is assessable vegetation.

Brolga

Thirty-nine percent (79.92 ha) of the Brolga ML is mapped as essential habitat (see Figure 2-29). The species for which it is essential habitat are discussed below in Section 2.3.9.5. These areas will not be adversely affected by the rehabilitation activities, and the rehabilitation of the adjoining areas will enhance habitat values for fauna. The planting list for the forest areas of the site contain threatened locally endemic species, such as *Corymbia xanthope.*

Canoona

Fifty percent (32.64 ha) of the Canoona ML is mapped as regulated vegetation – essential habitat (see Figure 2-30). The species for which it is essential habitat are discussed below in Section 2.3.9.5. The habitat values of the Canoona ML will not be adversely affected. Enhanced weed control and fire management practices (described in Section 6.1.9 and Section 8.1) will enhance habitat values for conservation significant species.

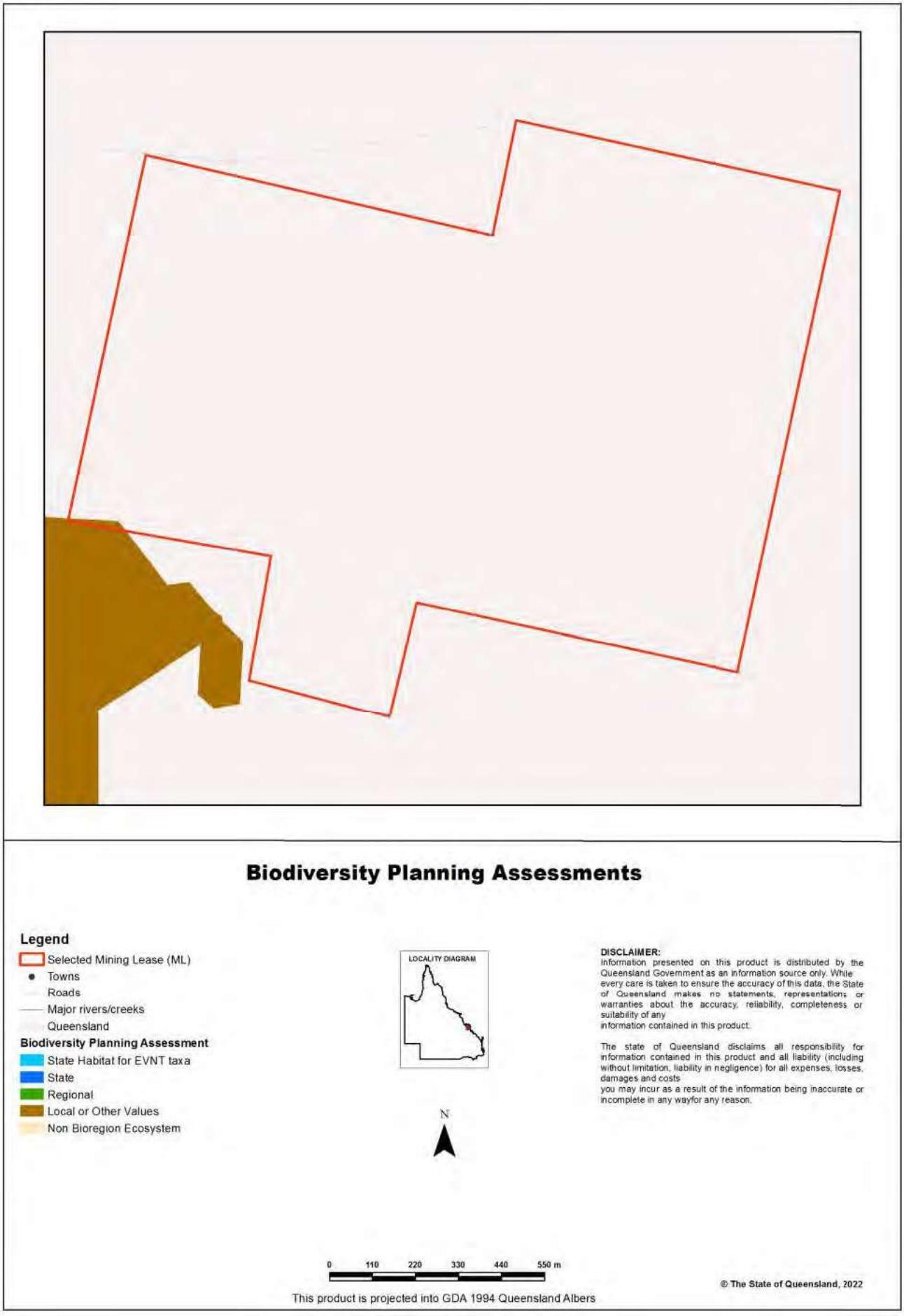


Figure 2-27. Brolga ML Biodiversity Significance

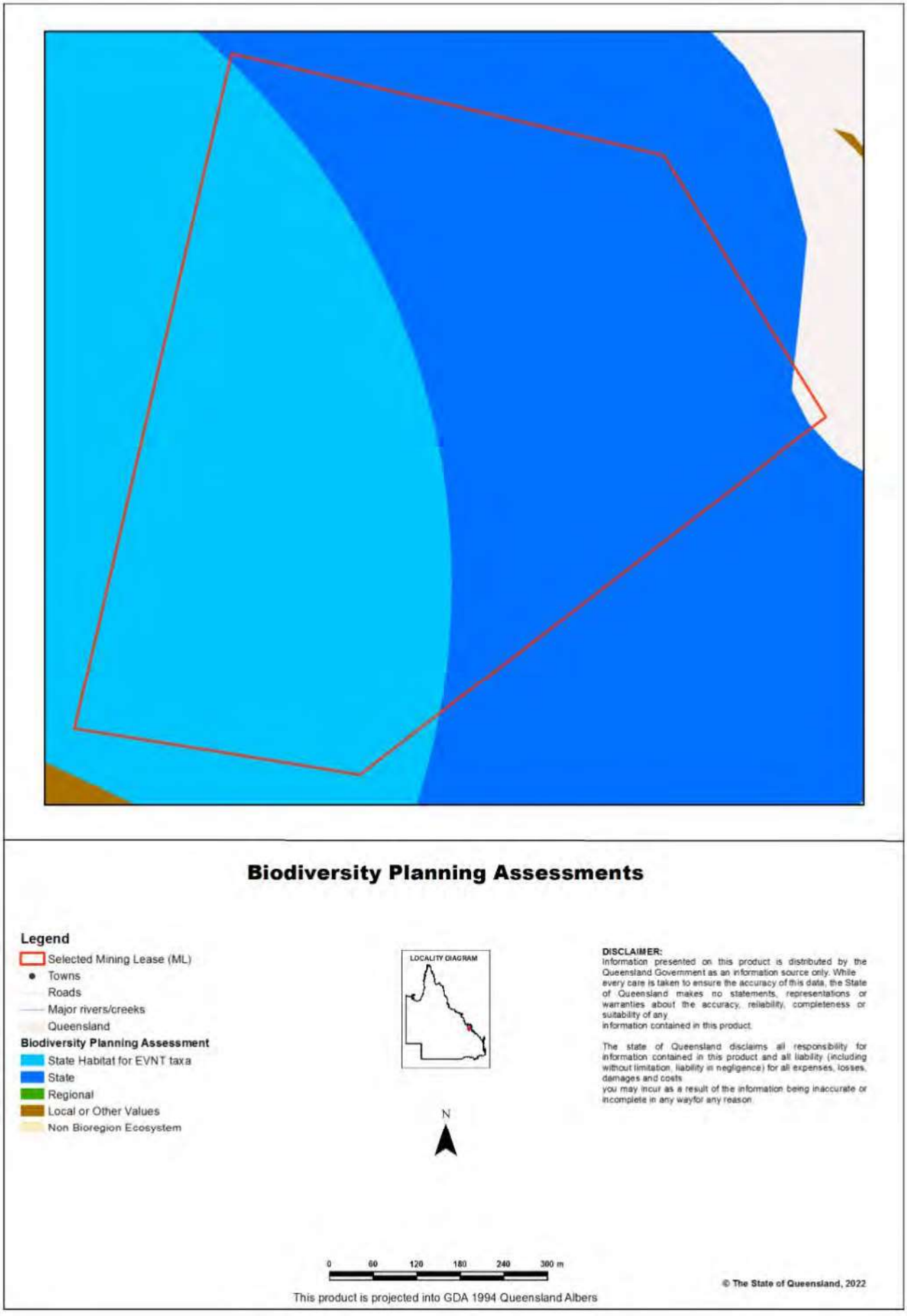


Figure 2-28. Canoona ML Biodiversity Significance

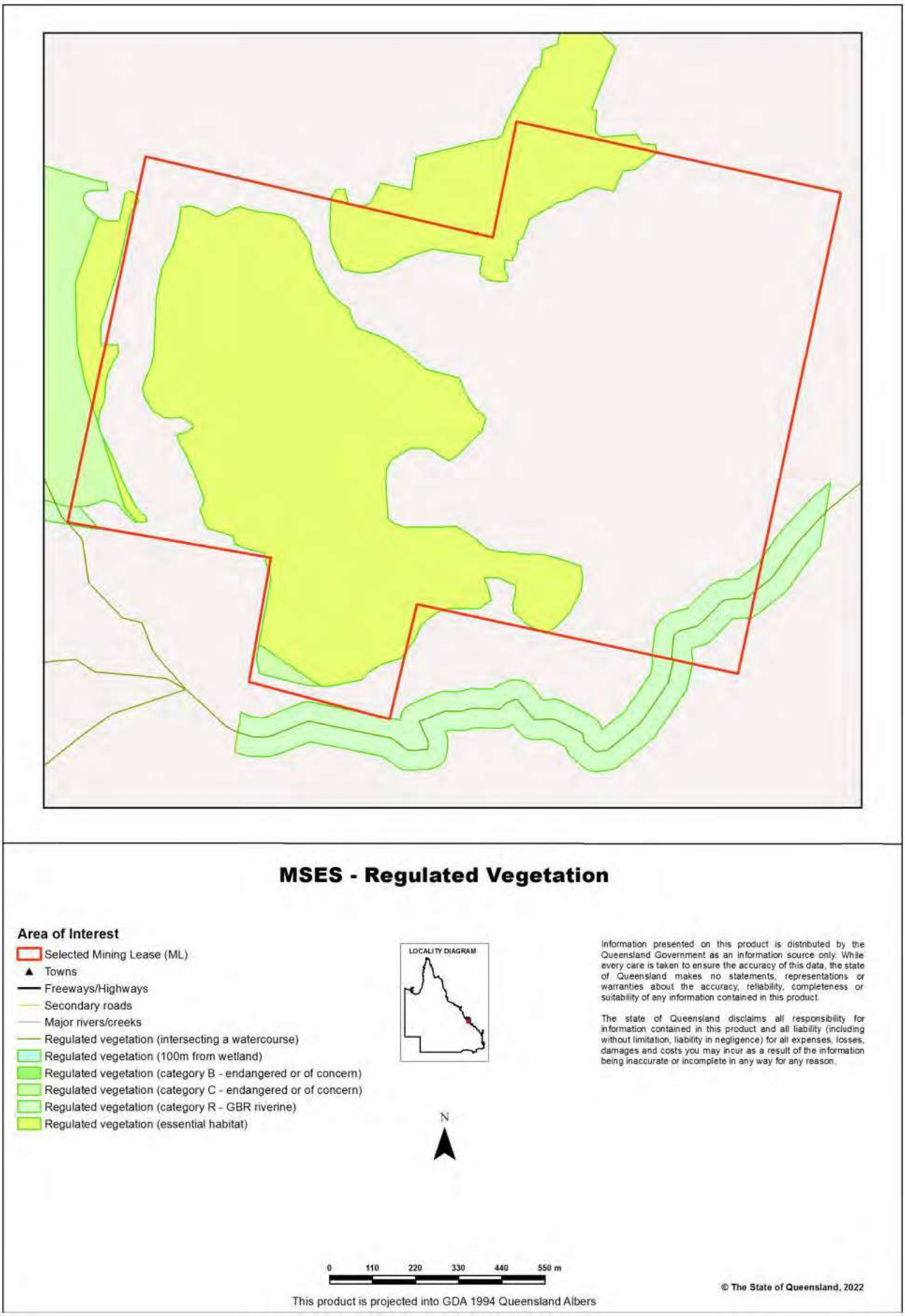


Figure 2-29. Brolga ML Regulated Vegetation

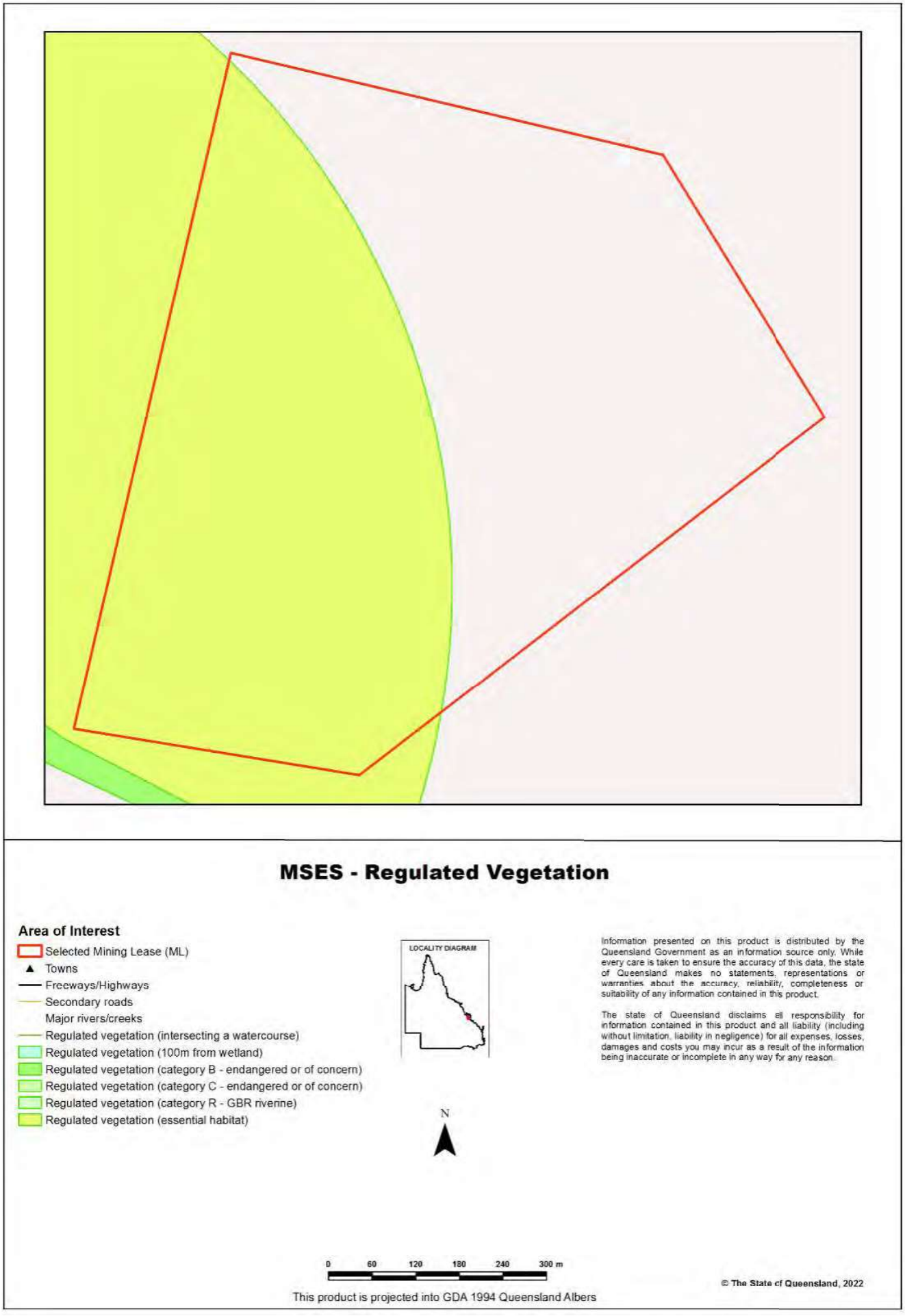


Figure 2-30. Canoona ML Regulated Vegetation

2.3.9.6 Other Regulated Vegetation

Small instances of the following MSES are mapped on the boundaries of the Brolga ML (see Figure 2-29). These areas have not been mined and will not be adversely affected by the rehabilitation activities.

- 2.35 ha of Endangered/Of Concern regrowth (Category C)
- 3.34 ha of Great Barrier Reef catchmnet riverine regrowth (Category R)
- 0.3 ha of vegetation management watercourse is mapped as present.

2.3.10 Flora and Fauna presence and populations

A Biodiversity and Conservation Values report and a Conservation Significant Species List was generated for each ML via the DES environmental reports online tool (see Appendix 5). The reports give the conservation significant species, recorded on, or within 4 km, and 1 km of the area of MLs, respectively. The results for the Brolga ML are given in Table 2-8 and for the Canoona ML in Table 2-9. Species recorded within 1 km are denoted in bold. In addition, 62.5% of the Canoona ML is mapped as having wildlife habitat for endangered or vulnerable fauna (see Figure 2-31). An ecological assessment of the Canoona ML, conducted in December 2021, confirmed the presence of *Corymbia xanthope, Macrozamia serpentina* and *Marsdenia brevifolia.*

Table 2-8. Conservation Significant Species, recorded on, or within 4 km of the Brolga ML

Species	Common Name	NC Act status	EPBC status	Back on Track rank
Bursaria reevesii		V		Medium
Capparis thozetiana		V	V	Medium
Corymbia xanthope	Glen Geddes bloodwood	V	V	Low
Hakea trineura		V	V	High
Macrozamia serpentina		E		Critical
Marsdenia brevifolia		v	V	High
Neoroepera buxifolia		V	V	Medium
Pimelea leptospermoides		NT	V	
Pimelea leptospermoides* subsp. *Leptospermoides		NT		Medium

Table 2-9. Conservation Significant Species, recorded on, or within 4 km of the Canoona ML

Species	Common Name	NC Act status	EPBC status	Back on Track rank
Capparis thozetiana		V	V	Medium
Corymbia xanthope	Glen Geddes bloodwood	V	V	Low
Geophaps scripta scripta	**squatter pigeon (southern subspecies)**	V	V	Medium
Hakea trineura		V	V	High
Macrozamia serpentina		E		Critical
Marsdenia brevifolia		V	V	High
Neoroepera buxifolia		V	V	Medium
Rhipidura rufifrons	**rufous fantail**	SLC		Low
Pimelea leptospermoides* subsp. *Leptospermoides		NT		Medium
Pultenaea setulosa		V	V	Medium
Stackhousia tryonii		NT		Medium

2.3.10.1 Weeds

Brolga

Past weed surveys on the Brolga ML identified the declared weed species lantana (*Lantana camara*), and giant rats-tail grass (*Sporobolus pyramidalis*). The environmental weeds snakeweed (*Stachytarpheta jamaicensis*), Guinea grass (*Megathyrsus maximus* var *maximus*) and buffel grass (*Cenchrus ciliaris*) were also recorded.

Canoona

Praxelis (*Praxelis clematidea*), stinking passionfruit (*Passiflora suberosa*), red Natal grass (*Melinus repens*) lantana (*Lantana camara*) and American rat's tail grass (*Sporobolus jaquemontia*) are present and generally restricted to the actual disturbance footprint (mostly the old drilling tracks) or within 10 m of the footprint, and have not spread into surrounding woodland to any substantial extent. However, approximately eight hectares is heavily infested with dense, continuous clumps of lantana, with instances of praxelis and stinking passionfruit evident in this zone.

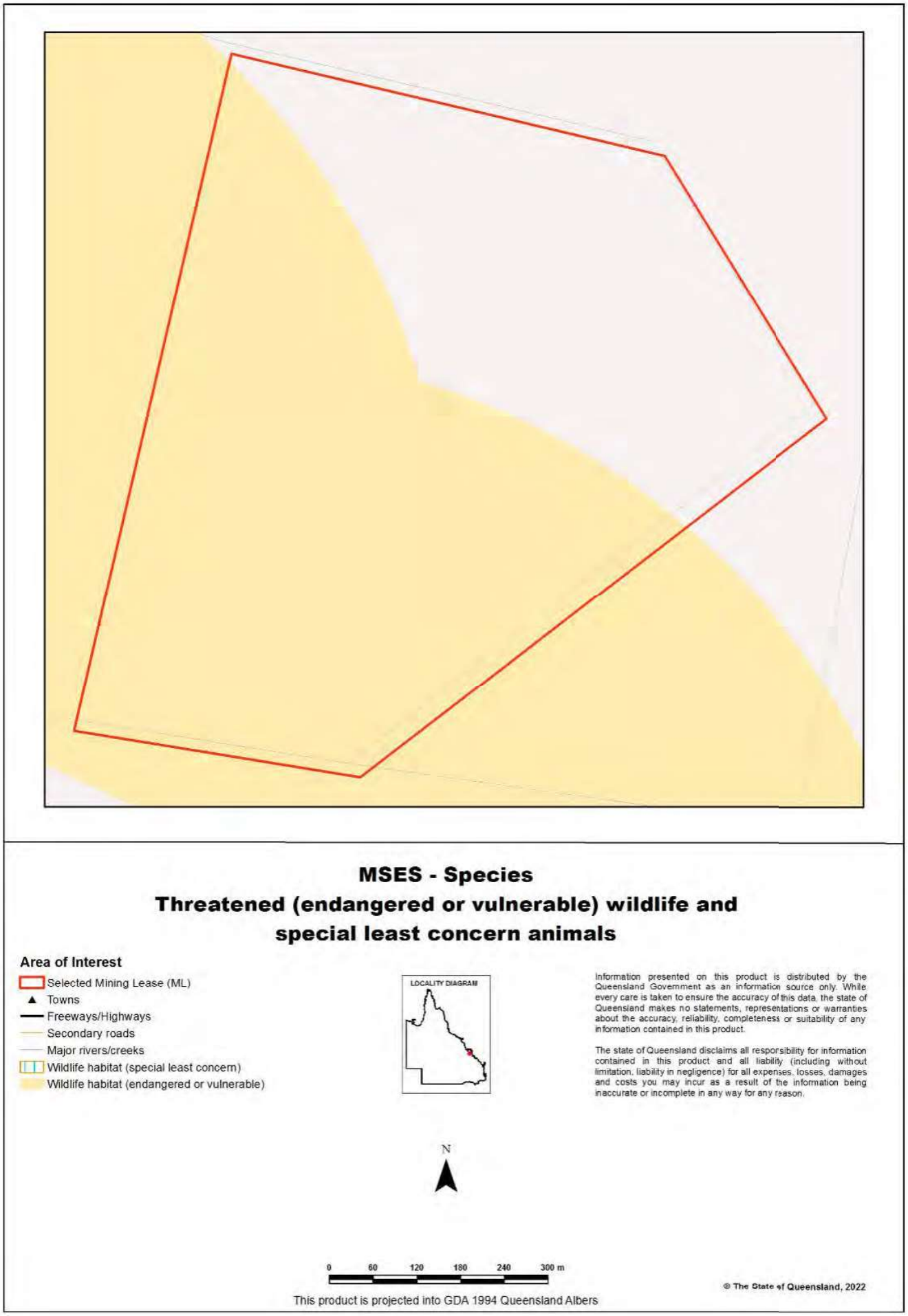


Figure 2-31. Canoona ML Endangered or Vulnerable Wildlife Habitat

2.3.11 Pre-mining land use

2.3.11.1 Brolga

Historic land use prior to exploration and mining appears to be mainly grazing. Within and near ML5866, some paddocks of forested areas were cleared of trees and probably improved by tillage, seeding and irrigation. To identify the pre-mining landscape, air photos from 1952 and 1979 were downloaded from Qimagery and georeferenced.

One paddock in the 1952 Brolga air photo (Figure 2-32) along the western boundary of ML5866 appears to have been prepared for cultivation along the lower slopes. The soil along these lower slopes has a significant clay content, giving it considerable plasticity with moisture and nutrient retaining characteristics, attractive for cropping. One field on the western lease boundary appears to have been tilled ready for sowing, and a nearby milking shed exists to this day. All other cleared areas in the 1952 photo are pasture areas.

The ML5866 Brolga 1979 air photo (Figure 2-33) shows that exploration drilling was being conducted by that time with regrowth of forest in previously cleared paddocks well established. Cultivation or cropping is not evident, and no contour banks or dams are in the area. Access tracks for exploration trucks caused considerable disturbance, and a pit appears to have been dug in the north-east corner of the future mining lease area. The pit was probably for fossicking for the semi-precious mineral chrysoprase, an activity popular in the area; the other possibility is that it might have been a bulk-sampling pit for nickel exploration.

The ML5866 Brolga 1994 and 1995 air photos (Figure 2-39 and Figure 2-40) show that substantial clearing had taken place for exploration and mining. It is not clear whether any pits had been dug at that time. It is interesting to compare it with the recent imagery in Figure 2-3 that shows the regrowth on the western side of the mining lease area.

2.3.11.2 Canoona

The ML5864 Canoona 1952 air photo (Figure 2-34) shows that the Canoona hill was still forested at that time. Some of the flat areas in the district were cleared, likely for cattle or sheep grazing. The Bruce Highway did not traverse this district at that time, although the railway line did, and probably facilitated rural development in the area. Some buildings are present near the Canoona rail siding at the apex of the railway line. Subsequent air photos have been viewed and confirm the area of Canoona has never been cleared of forest vegetation.

2.3.12 Early Mining Activity and Rehabilitation

A previous tenement holder conducted nickel mining within the ML5866 area in the early 1990's, and later, rehabilitation. Section 2.7.1 provides a description of the former tenement holder mining and rehabilitation activities.

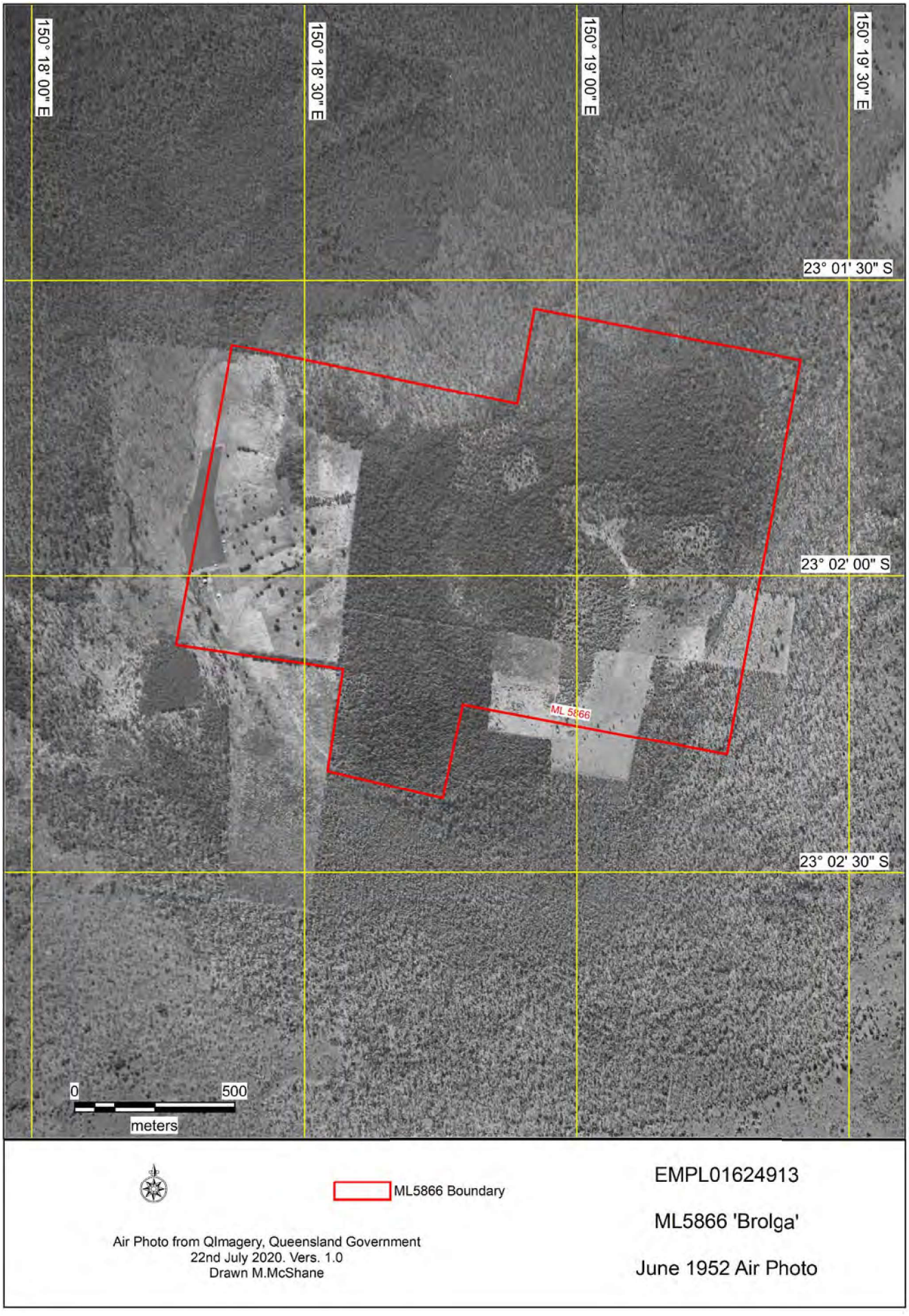


Figure 2-32. June 1952 Air Photo ML5866 Brolga

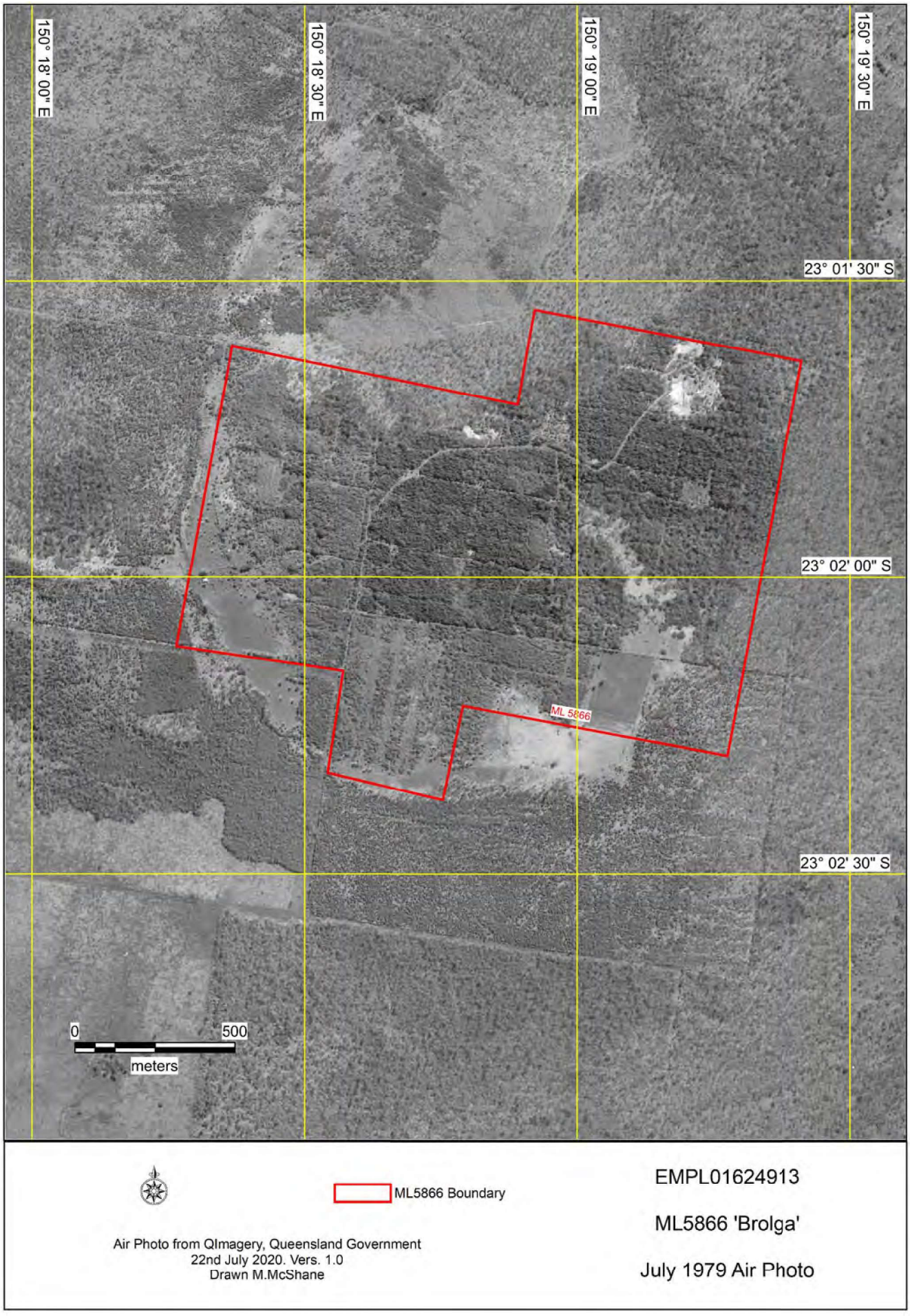


Figure 2-33. July 1979 Air Photo ML5866 Brolga

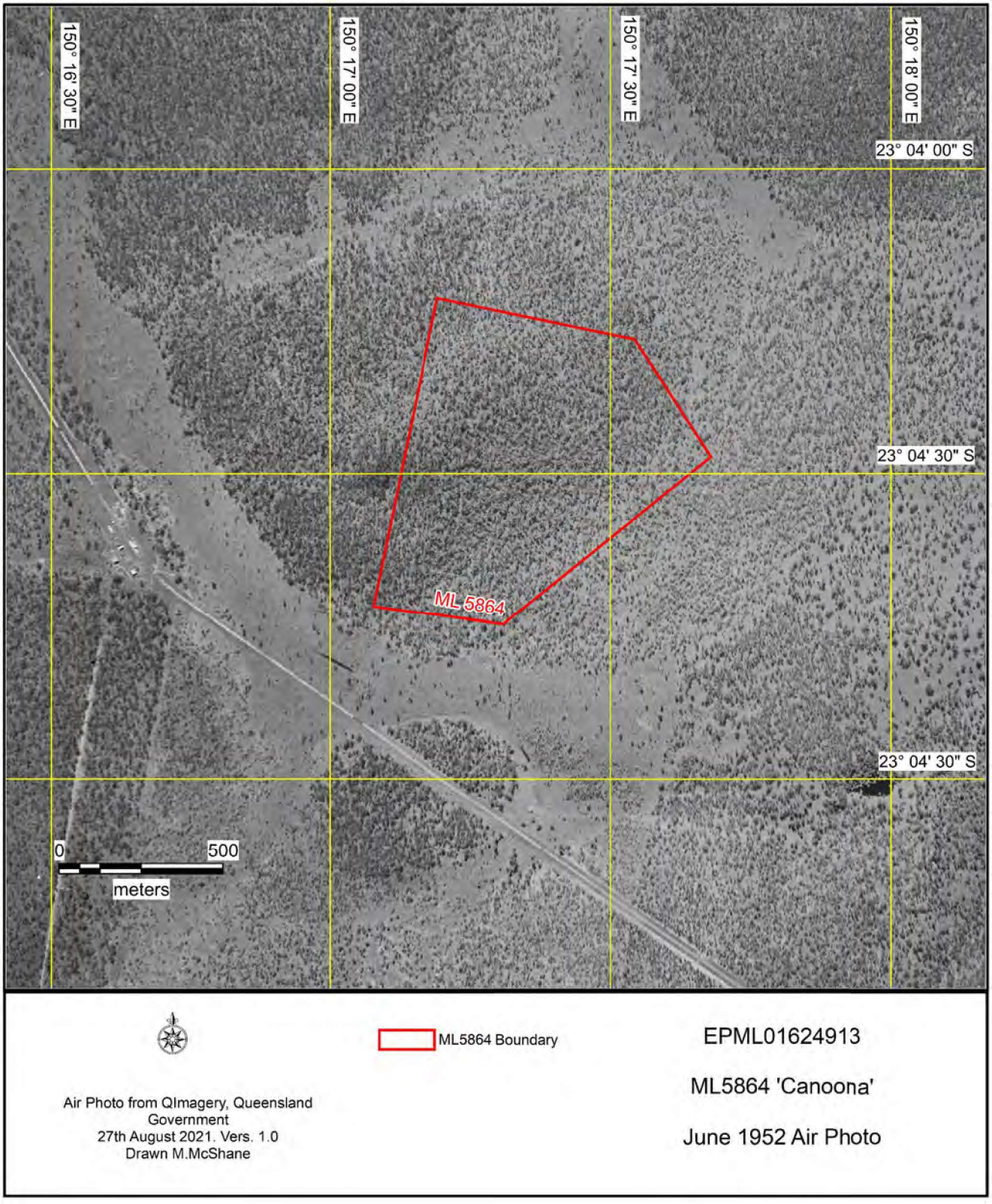


Figure 2-34. June 1952 Air Photo ML5864 Canoona

2.3.13 Surrounding Land Uses

The Livingstone Regional Council's Planning Scheme 2018 as depicted on its web service mapping tool (Figure 2-35) shows that the zoning in the area of the EA and the surrounding area is almost entirely 'Rural'.

The surrounding land uses are shown in Figure 2-36. Surrounding land uses are mainly cattle grazing, cereal crop cultivation, magnesite mining and forestry. A major highway (Bruce Highway) and railway (Northern Line) are less than five kilometres from Brolga and one kilometre from Canoona. Magnesite mining is carried out immediately east of Canoona. The nearest township, Yaamba, is eleven kilometres south-east.

Land use on the immediately surrounding properties is almost entirely cattle grazing. Most surrounding pastures have been improved for the purposes of grazing by the construction of contour banks, access tracks, dams, fences and stock watering facilities, the clearing of forest vegetation, and introduction of pasture grasses. Grazing and cropping intensity varies with soil quality and water availability.

Substantial areas of cropping and cultivation are located to the east along the floodplain soil of Alligator Creek, and to the south on areas of low topographic relief on floodplain soil along the Fitzroy River.

2.3.14 Underlying Landholders

All land parcels within the mining leases ML5866 and ML5864 are owned by QNI Resources Pty Ltd and QNI Metals Pty Ltd. All are in the Livingstone Shire Council Local Government Area.

Table 2-10. Underlying Landholders

Owner	Lot	Plan	Tenure
QNI Resources Pty Ltd and QNI Metals Pty Ltd (ML5866)	1	SP322712	FH
QNI Resources Pty Ltd and QNI Metals Pty Ltd (ML5866)	176	LN473	FH
QNI Resources Pty Ltd and QNI Metals Pty Ltd (ML5864)	1	RP620757	FH

2.3.15 Adjoining landholders

Sensitive Receptors are shown on Figure 2-37. The majority of receptors are grazing farm-houses and associated farm buildings. One is a rest area along the Bruce Highway, and one is the infrastructure associated with the nearby magnesite mine.

No rehabilitation work is required on ML5864, where most sensitive receptors are located. The nearest receptors to the Brolga ML (i.e. where the works will take place) are rural residences located 1.5 kilometres north of the site and 2.5 kilometres to the south-west of the site (see Figure 2-37).

There will be no operations at night on either mining lease, so it is unlikely that noise will become an issue with any of the occupants. The potential for dust and weed movement are issues of concern for some neighbours (see Section 3), and management and mitigation measures have been included as part of this PRCP (see Sections 8.1.6 and 8.1.7).

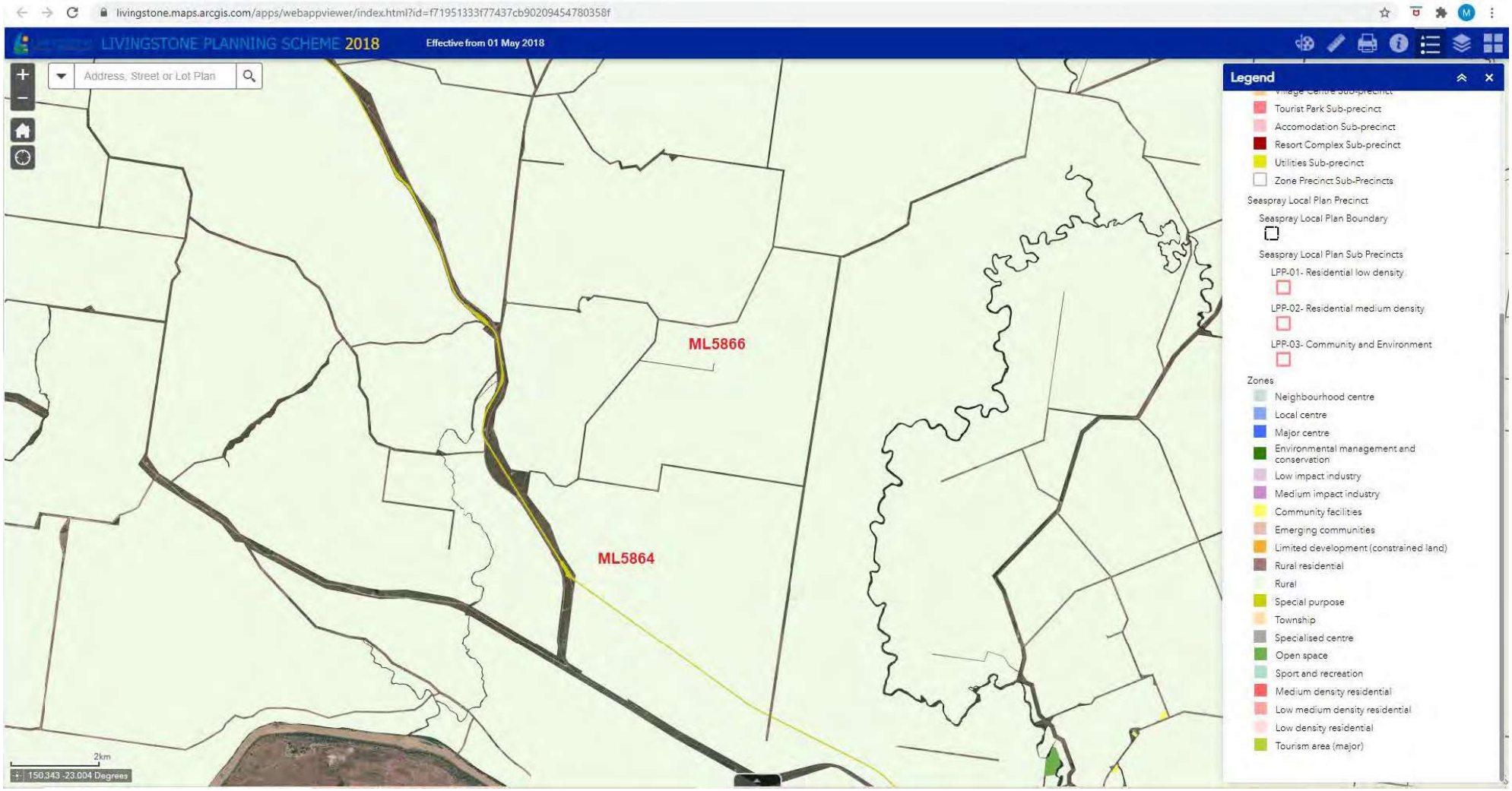


Figure 2-35. Local planning scheme zoning

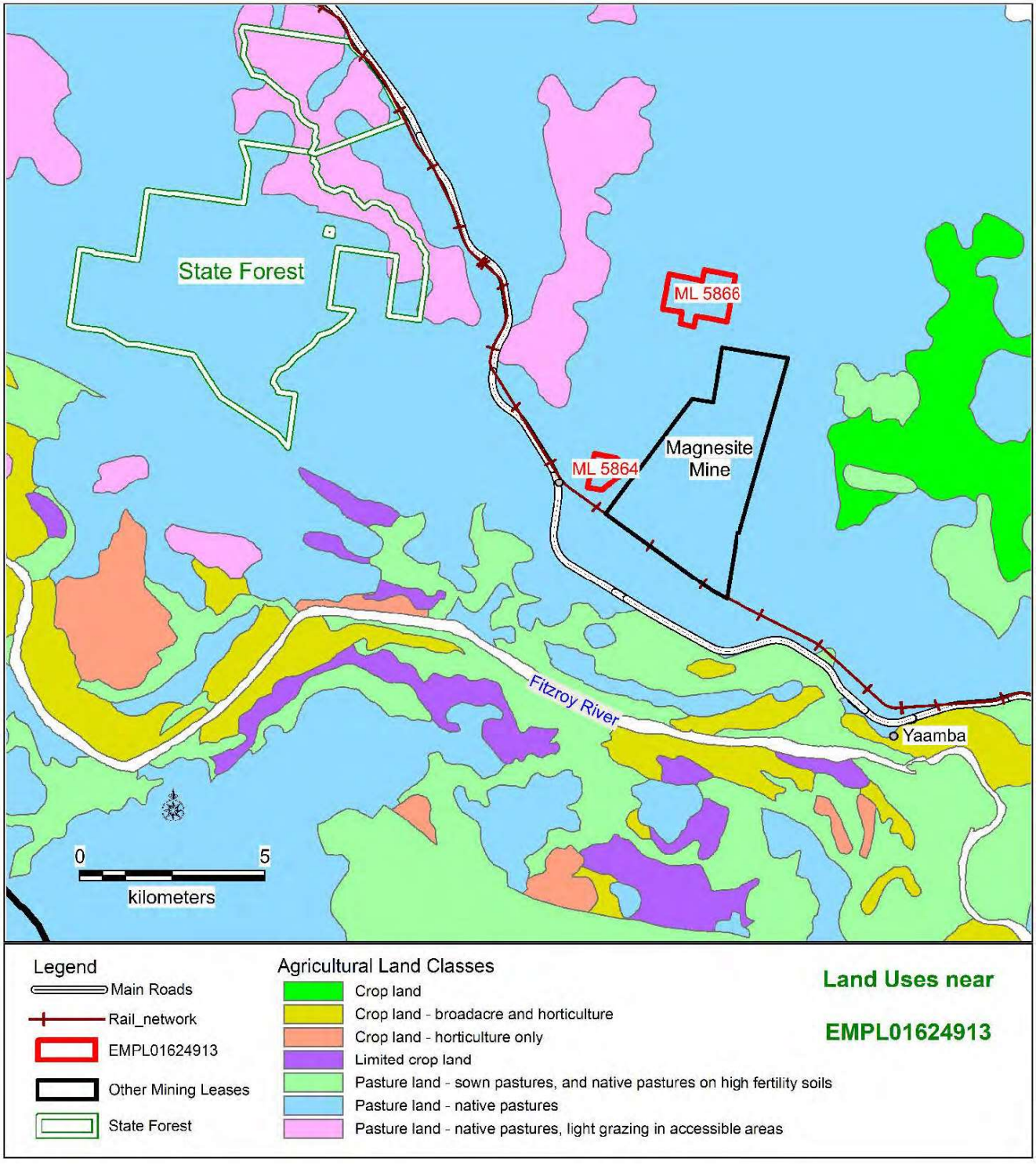


Figure 2-36. Surrounding land uses

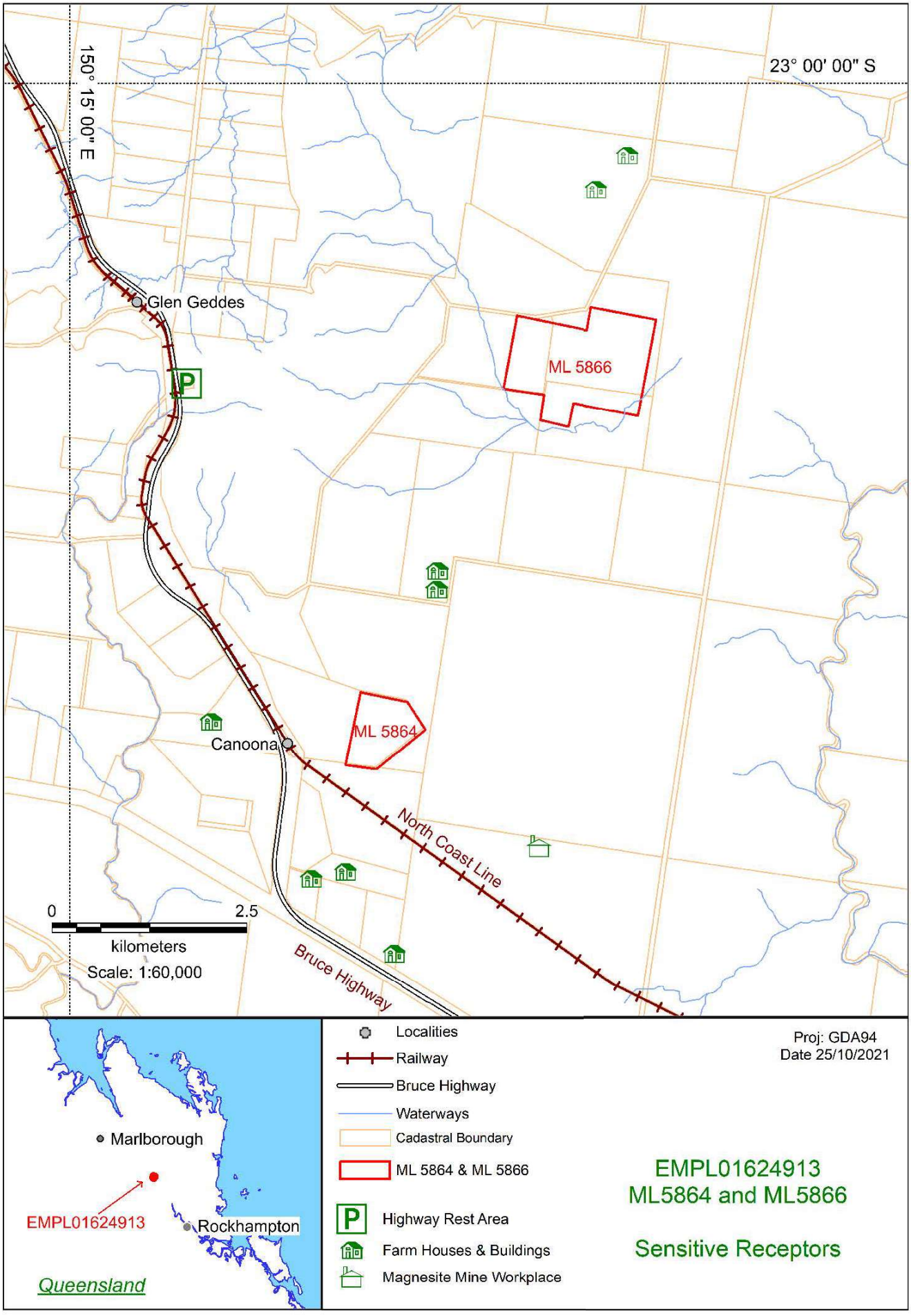


Figure 2-37. Sensitive Receptors

2.4 Design for Closure

The PRCP Guidelines specify that, to demonstrate that rehabilitation will be maximised for the mine site, the rehabilitation planning part of the PRCP for new or expanding sites must include a description of how a number of aspects of the mine have been designed for closure.

The Brolga Project is not new or expanding so 'design for closure' is not relevant to this PRCP.

2.5 Rehabilitation/improvement planning

The PRCP Guidelines state that the administering authority has the expectation that all disturbed land, which is available for rehabilitation or improvement, should be progressively rehabilitated throughout the operation of the mine. Progressive rehabilitation must be maximised by commencing and completing rehabilitation as soon as practicable after land becomes available. As the mine is no longer operational, all areas of land are available for rehabilitation.

ML5866 Brolga is 204.3 hectares in total area. As the mine is no longer operational, the mining activity is currently at its maximum disturbance footprint, of 52.4 hectares.

Mining has occurred on ML5866 Brolga only. No mining activity, other than exploration, has taken place on ML5864 Canoona.

The Area of Disturbance for Brolga is shown at Schedule 1 of the Environmental Authority EPML01624913 – this figure is replicated at Figure 2-38 of this document. All remaining activities under the current mine plan include only rehabilitation works. Proposed rehabilitation activities cover the entire maximum footprint.

2.5.1 Progressive rehabilitatation

Given that the current mine plan includes rehabilitation only, progressive rehabilitation can be applied to several mine features at once. The Planning Process and Design for Closure has considered the risks of attempting to rehabilitate too many features in unison, which would create an unacceptable risk of failing.

2.6 Spatial Information

Spatial information as a Shapefiles has been submitted to the Department along with the submission of this PRC Plan. As per the requirements of Attachment 1 of the PRCP Application Form, shapefiles detailing the following information have been submitted:

- the location and maximum extent of disturbance footprint for the mine life
- the PMLU for the area within the resource tenures
- the rehabilitation areas within the resource tenures
- any sensitive receptors
- extent of a floodplain.



Figure 2-38. Brolga and Canoona Area of Disturbance – Schedule 1 EA EPML01624913

2.7 Existing rehabilitation

2.7.1 Pre QNI mining rehabilitation

A previous holder of the tenement conducted nickel mining within the ML5866 area from 1993 until 1995. Plans from that earlier stage of mining are not available to QNI, so exact details can not be given. However, the extent of operations at that time may be gauged from Figure 2-39 and Figure 2-40, which are a series of air photos from that period and illustrate the extent of disturbance that occurred around that time – pits can be seen in the western part of ML5866 (Figure 2-39).

Rehabilitation progress is illustrated by Figure 2-41, an air photo taken in 2004. A recent aerial image (Figure 2-3) shows that some of the areas that were mined or cleared in the 1990's have recovered to forest. The regrown forested areas are now primarily *Acacia* woodlands. A large area of land on the western side of ML5866 was revegetated during the late 1990's. That area has since become included as a Matter of State Environmental Significance, Regulated Vegetation – Essential Habitat (Figure 2-29).



Figure 2-39. Brolga Air Photo March 1994



Figure 2-40. Brolga Air Photo December 1995



Figure 2-41. Brolga Air Photo July 2004

In terms of the method of rehabilitation activity, the area was selectively ripped in July 1999 and grass species planted. By 2002, previously mined areas had been re-contoured, topsoiled and, along with the cleared areas, seeded with green panic, silk sorghum, and Rhodes grass. Drill holes had been rehabilitated and areas which were slow to revegetate were re-ripped and seeded.

Site inspections to monitor the progress of rehabilitation at the site were completed in 2002, 2003, 2006, 2009 and 2011.

CQG Consulting were commissioned by QNI in 2012 to undertake an assessment of the rehabilitation status of the site at the time. A CQG ecologist and environmental scientist performed an Ecosystem Function Analysis (EFA) across six transects within the Brolga ML to provide a description of the functionality of the biogeochemical processes of the landscape through use of rapid assessable field indicators. The study investigated soil quality, vegetation structure, erosion, weeds and other environmentally relevant issues. Transects were positioned with a focus on areas of historic mine workings with accompanying reference transects placed outside of these areas (but within the mining lease) as controls. The EFA was performed in accordance with the CSIRO Landscape Function Analysis Manual (Tongway and Hindley, 2004). The key findings were:

- Ground cover across the study site was above 50 percent, indicating that revegetation had had a visible positive impact
- Some small areas, particularly those disturbed by historic mine workings and tracks, did contain bare dispersive soil with potential for erosion
- Vegetation and grass patches contributed greatly to the stability, infiltration and nutrient cycling of ML5866
- Low indices for transects 001, 002 (historic mine workings) indicated that follow-up revegetation may be required in these specific areas
- The ecosystems on ML5866 are functioning successfully, although it was recorded that work would be required to address the monoculture effect caused by the prevalence of lantana and *Acacia* spp.
- Weed control strategies were recommended to control both lantana and giant rats tail grass within the mining lease.
- It was recommended that the removal of lantana, which at the time was contributing to soil stability and nutrient cycling, should be conducted in concert with revegetation activities such as planting of native seedlings and grasses to prevent the backtracking of the land condition
- Weed control practices that did not involve the removal of the plant matter (i.e. herbicide spraying) were recommended to allow the remaining dead plant material to provide some soil erosion protection
- The condition of ML5866 – Brolga was considered largely suitable for its target end use as grazing land.

2.7.2 QNI rehabilitation

The CQG report commissioned by QNI was utilised in the development of the 'Brolga Rehabilitation Management Standard', which was developed to satisfy conditions G1 – G9 (Land and Rehabilitation) of the Environmental Authority (EMPL01624913).

The main features of the progressive rehabilitation process set out in the 'Brolga Rehabilitation Management Standard' include the following:

- construction of a stable final landform with minimal ponding of water within waste dump/backfilled areas
- progressive construction of the final landform design as part of normal mining operations, such that minimal reshaping is required at the end of mining
- use of suitable topsoil, which will either be stockpiled until suitable rehabilitation areas are available, or re-spread immediately across available rehabilitation areas
- deep ripping (as an erosion control measure and to facilitate seed propagation), seeding and (if required) fertiliser application preferably prior to the commencement of the wet season to maximise the benefits of subsequent rainfall
- treatment of declared weed species, when necessary, and
- minimisation of the final void area to reduce the potential for collection of water from direct rainfall and runoff from the rehabilitated landform.

Mining recommenced at Brolga in 2014 and continued until 2017. To date, QNI has undertaken the following rehabilitation measures and practices at the Brolga ML.

- stockpiling of topsoil
- back-filling of mined-out pits and respective bunding, covering an area of 19.5 hectares, comprising
  - Pit 1 – 20 % back-filled, in 2014 – 2015
  - Pit 2 – 100% back-filled, in 2014 – 2016
  - Pit 3/Oversized Dump – back-filled to 70% of its volume, during 2015 – 2016
  - Pit 4 – back-filled to 80% of its volume, during 2015 – 2016
  - Pit 5 North – 80% back-filled, during 2015 – 2017. About 14,000 cubic metres of fill are required to completely back-fill Pit 5 North.
  - Pit 5 South – 80% back-filled, during 2015 – 2017. About 29,000 cubic metres of fill are required to completely back-fill Pit 5 South.
- Monitoring for, and treatment of, declared weed species.

These works occurred progressively during mining operations. They have not been applied for to be progressively certified under the EP Act.

The other lease covered by the EA is ML5864, referred to as ‘Canoona’. It is 64.6 hectares in total area. ML5864 has had no mining activity and remains covered by remnant vegetation (RE 11.11.7 *Eucalyptus fibrosa*). Small areas of disturbance have occurred as a result of exploration, but natural revegetation of the disturbed areas has occurred and as such, the site requires no rehabilitation activity (any attempt to undertake rehabilitation would create more damage than benefit). The only rehabilitation related activities that have occurred on the Canoona ML are the building of a fence and weed maintenance.

3 Community Consultation

3.1.1 Background and purpose

This section describes the community and stakeholder consultation that has been undertaken to inform the development of this PRCP (consultation register), and the consultation that will be undertaken throughout the implementation of the PRCP (consultation plan).

As noted in Section 2.1, the Project is located in a sparsely populated area off the Bruce Highway approximately 55 km north of Rockhampton. The land directly surrounding the ML's is characterised by cattle grazing and sparse settlement on the various properties. QNI Resources Pty Ltd and QNI Metals Pty Ltd are the owners of the land, and there are three landholders directly adjacent to the sites. The nearest towns or townships are Marlborough located 52 km to the north-east and Yaamba approximately 11 km to the south-west. The project is located within the Livingstone Shire Council Local Government Area.

The mine is in care and maintenance with very limited activities taking place on site, and as such the move to rehabilitation is unlikely to cause any noticeable impacts on nearby communities.

3.1.1.1 Stakeholders

As a starting point for the consultation process a stakeholder identification process was undertaken, seeking to identify stakeholders that would potentially be impacted by the project or who had an interest in it. For the purpose of this plan, and due to the very limited anticipated impact of the project, the three private landholders adjacent to the sites, the two occupied properties along the access road (Nickel Road), as well as the local council were considered pertinent stakeholders for inclusion in the consultation process[3].

The stakeholder identification is presented in Table 3-1 below. Note that individual names have been removed to protect the privacy of individual stakeholders, where landholders are companies or government entities names have been revealed.

Figure 3-1 shows the sites and adjacent landholders.

[3] No community groups have been identified relevant to the area, and a search of the National Native Title Tribunal's registers identified no claims or determinations over the ML's.

Table 3-1. Stakeholder Identification

Category	Stakeholder
Underlying landholder (QNI Resources Pty Ltd and QNI Metals Pty Ltd)	Landholder of Lot 176 on LN473 and Lot 1 on SP322712 (Brolga) and Lot 1 on RP620757 (Canoona)
Adjacent landholders of ML5866	Landholders of Lot 178 on LN604 (Landholder 1)
	Landholders of Lot 183 on LN91 (Landholder 1)
	QMCH Pty Ltd & QMC (Kunwarara) Pty Ltd (Lot 629 on LIV40156) (Landholder 2)
	Yeppoon Grazing Pty Ltd (Lot 173 on LN393) (Landholder 3)
	Yeppoon Grazing Pty Ltd (Lot 175 on LN473) (Landholder 3)
Adjacent landholders of ML5864	QMCH Pty Ltd and QMC [Kunwarara] Pty Ltd) (Lot 3 on RP620757) (Landholder 2)
	QMCH Pty Ltd and QMC [Kunwarara] Pty Ltd) (Lot 1 on RP601266) (Landholder 2)
	Qld Dept of Transport and Main Roads (Lot 172 on SP108274)
	QNI Resources Pty Ltd and QNI Metals Pty Ltd (ML owner)
Occupied properties adjacent to access road	Landholders of Lot 1 on RP889900 (Landholder 4)
	Landholders of Lot 2 on RP889900 (Landholder 5)
Local government	Livingstone Shire Council
Community	Marlborough / Raspberry Creek Community

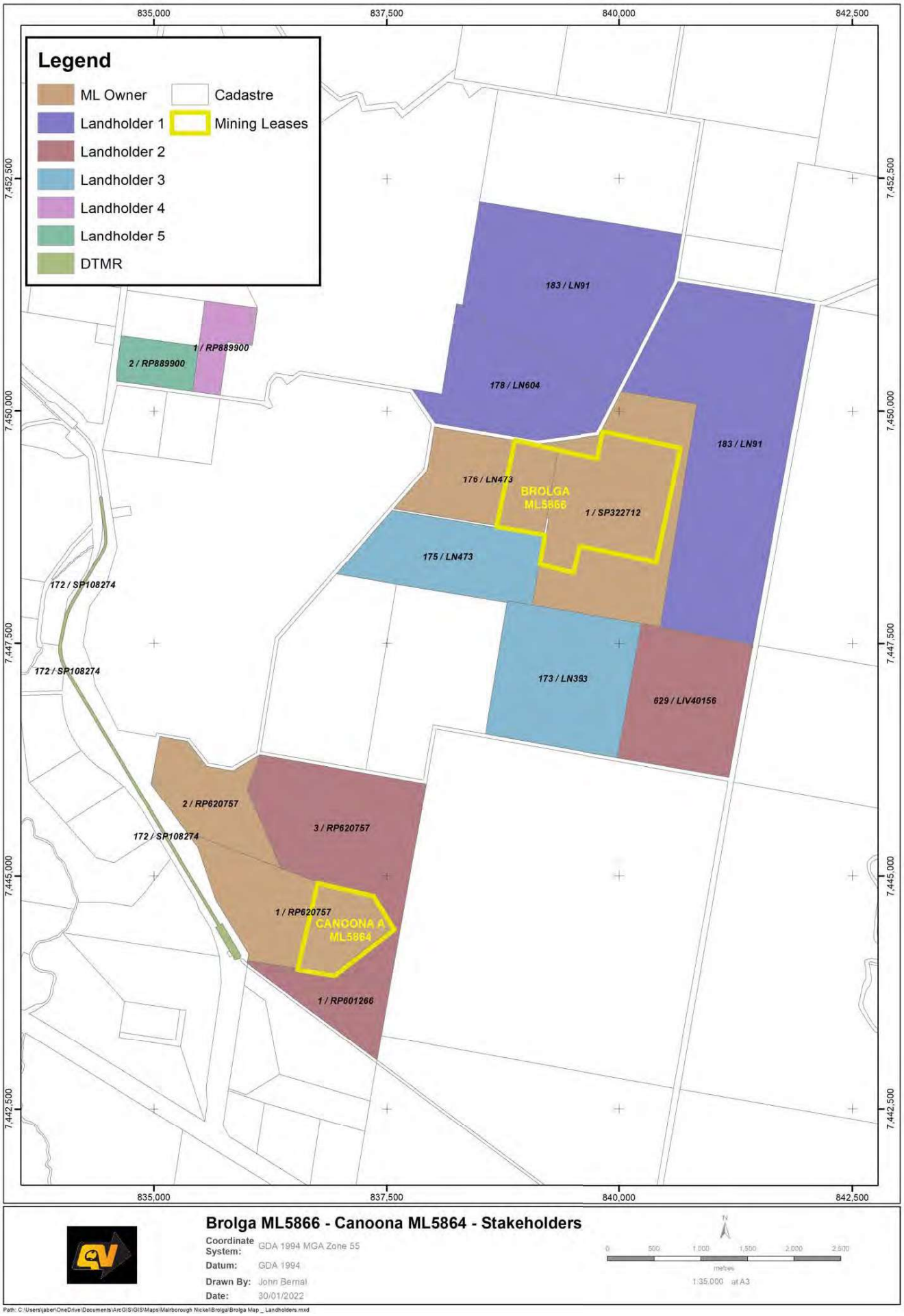


Figure 3-1. Adjacent landholders

3.1.2 Consultation Register

Informal consultation has occurred with the adjacent landholders over the life of the mine, including when it has been under care and maintenance.

The Mine Manager, who had main responsibility of the mining operations on site, and will be responsible for the rehabilitation and closure works, is a local and lives in the nearby community of Marlborough. As such, the Mine Manager has engaged with local stakeholders via a variety of methods, including face to face meetings and briefings at different opportunities with people from town, business owners, and adjacent landholder to share information about the status of the mine and the rehabilitation. Although these meetings have not been recorded, valuable information has been extracted from them and applied in this PRCP.

Specifically for this PRCP, the following formal consultation has occurred:

1. A letter with key content of the plan was sent to the five relevant private landholders on 23 December 2021 and council in January 2022 (a copy of the letter is provided in Appendix 7).
2. The proponent directly sought to contact these via phone or email in January 2022 to follow up on the letter and offer a face to face meeting or phone consultation.
3. Three of the landholders and council accepted the offer and face to face or phone consultation meetings were subsequently held with these. A consultation protocol was developed for these meetings to guide the discussion, seeking to elicit any concerns, expectations for ongoing consultation, and views on the proposed post mining land use and final landform.

One landholder near the access road (Landholder 5) was unable to be contacted via phone as the property had recently been sold and contact details were not readily available.

Table 3-2 below provides the community consultation register.

3.1.3 Consultation plan

In light of the limited impact of the project, and relatively low level of interest from most stakeholders, a targeted consultation program has been developed with the objectives of:

- *informing* adjacent landholders about key events during the implementation of the plan, particularly events which may impact them.
- providing them with an opportunity to *raise any issues* during the implementation of the plan.
- *informing* adjacent landholders and council when the plan is completed.

Table 3-3 below outlines the consultation activities currently planned during the implementation of the plan. As there was a relatively low level of interest in scheduled communication other than at relevant events, no regular information provision (such as annual updates) is planned.

Table 3-2. Consultation register

Consultation Date	Community member	Consultation type	Information provided	Summary of discussion / issues raised	How issues were considered	Decisions /outcomes	Commitments
18/01/22	Landholder 1	Face to Face meeting	Letter provided in Appendix 7. Figures showing final land form and post mining land use.	• Confirmed letter had been received • Discussed weed control • Discussed run off from block • Discussed post mining land use.	• Landholder (LH) is concerned with a perceived inactivity on weed control, specifically Giant Rats Tail Grass. We were treating this specific weed with control agent when the landholder arrived for meeting. • Run off from the block is also an issue. This was more about actual water flowing off the side of the hill and not Mine runoff. • LH was happy with post mining land use as low impact grazing rather than perceived feral animal haven if returned to native habitat.	• Improve weed control	• Increase frequency of weed control – see Section 8.1.6
20/01/22	Landholder 4	Phone Meeting	Letter provided in Appendix 7. Figures showing final land form and post mining land use.	• Confirmed letter had been received. • Discussed weed control and potential for dust. • Discussed post mining land use.	• Giant Rats Tail Grass is a concern for the landholder. How to ensure limit of spread was discussed. Confirmed weed control would be investigated. • The potential for an increase in dust if increased traffic levels was also raised. Informed the landholder minimal traffic was expected unless mining resumed which is not currently planned • The Landholder was happy with post mine land use as grazing.	• Improve weed control	• Increase frequency of weed control – see Section 8.1.6
21/1/22	Landholder 3	Phone meeting	Letter provided in Appendix 7. Figures showing final land form and post mining land use.	• Confirmed that letter had been received. • Discussed run off and potential for weed spread. • Discussed dust monitoring and communication during rehabilitation works.	• Landholder noted the letter had been in the weather and a bit damaged. Electronic copy was emailed to LH after meeting. • The landholder was concerned about water runoff from the mine property on the northern side of their property, and the potential for that to spread weeds. • The landholder was also interested in dust monitoring during rehabilitation works. • The landholder would like a meeting with QNI to discuss works potentially affecting their property prior to them commencing. Committed to meeting as requested	• Improve weed control. • Consult with LH prior to relevant works	• Increase frequency of weed control see Section 8.1.6 • Meet with LH prior to activities which may affect them in accordance with

Consultation Date	Community member	Consultation type	Information provided	Summary of discussion / issues raised	How issues were considered	Decisions /outcomes	Commitments
				• Discussed post mining land use.			consultation plan. • Implement dust control in accordance with section 8.1.7 of this plan.
4/2/22	Landholder 2	Email	Letter provided in Appendix 7. Figures showing final land form and post mining land use.	• The Landholder had no issues with the proposed plan and had no further comments.	• N/A	• N/A	• N/A
7/2/22	Livingstone Shire Council NRM officers	Teams	Letter provided in Appendix 7. Selected content from ecological assessment and draft PRCP, particularly relating to proposed revegetation species and post mining land use	• Post mining land use • Species selection, timing for seeding, seed acquisition. • Ongoing engagement with council • Species selection, seed acquisition and timing for seeding was discussed.	• Council officer noted they operated a community nursery with plants endemic to the serpentinite region. • Officer noted that low intensity grazing was an acceptable post mining land use but cautioned about impacts of too high intensity grazing. • Discussed which species would be suitable, as well advisable time and method for seeding. Council officer noted the proposed timing in the plan might not be suitable. Discussed that trials would be useful to understand optimal timing. • Council officers also noted challenges about acquiring seeds, and mentioned that if seeds were purchased from the community nursery they would like advance notice and a small upfront payment.	• Continue to engage with council around revegetation efforts throughout the completion and implementation of the plan. • Sent ecological assessment to council officers. • Species selection described in Section 6.1.8 expanded using council information.	• Engage with council again prior to completion of plan in accordance with consultation plan.

Table 3-3. Planned consultation activities

Objective	Engagement type	Proposed consultation frequency	Released information	How feedback / comments are considered
Inform all landholders about commencement of activities.	Letter, email or phone as per their preference.	One off – on commencement of activities, currently scheduled for April 2024.	Letter confirming the activities, location and schedule.	Consider in schedule and execution plan.
Inform landholder about works that may affect them.	Phone or face to face meeting.	One off – on commencement of activities in area adjacent to Yeppoon Grazing Pty Ltd's property, currently scheduled for 2024 (the rehabilitation trials -RA1).	Schedule, nature and location of relevant activities.	Consider in schedule and execution plan.
Inform all landholders about unanticipated material change in schedule or methodology.	Letter, email or phone as per their preference.	One off – should unanticipated material change in schedule or methodology occur	Nature of unanticipated change.	To be determined depending on the nature of change.
Consult with council about final species selection and methodologies.	Teams or face to face meeting. Site visit.	One off and potentially ongoing during implementation.	Relevant aspects of plan.	Confirm species selection and seeding methodologies.
Inform all landholders about completion of activities.	Letter, email or phone as per their preference.	One off – on completion of the plan, currently scheduled for April 2033.	April 2033.	Inform all landholders and council via letter / email / phone as per their preference.
Enable all landholders to *raise concerns.*	Provide phone number and email address to all landholders.	Reactive.	Contact phone number and email.	To be determined depending on the nature of concerns raised.

4 Post-mining Land Use

The post-mining land use (PMLU) for both Brolga and Canoona, in both disturbed and non-disturbed areas, will be low-intensity grazing. The Area of Disturbance for the Brolga Project is detailed in Schedule 1 of the Environmental Authority EPML01624913, which is replicated in this document as Figure 2-38. The unshaded area shown in Figure 2-38 in the north part of the Mining Lease is a Conservation Area, which was designated (in the land outcome document 'Brolga Rehabilitation Management Standard' [Appendix 3]) to be undisturbed by rehabilitation activities, other than weed control and fencing to ensure protection from excessive grazing.

4.1 ML5866 Brolga

4.1.1 Consistency with Land Outcome Document

The PMLU of low-intensity grazing set out in this PRCP was previously addressed in the land outcome document 'Brolga Rehabilitation Management Standard' (Appendix 3). This document was prepared to satisfy condition G3 of the Environmental Authority (EMPL01624913) which required that, "All areas significantly disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover in accordance with the submitted rehabilitation management plan". The document was approved on 28 May 2014 and was the rehabilitation management standard being utilised prior to the enactment of the *Mineral and Energy Resources (Financial Provisioning) Act 2018* (MERFP Act) which brought about the requirement to submit this PRCP.

4.1.2 Consistency with past land use, surrounding land uses and stakeholder preferences

The main land use in the areas surrounding the MLs is grazing – more specifically, Pasture Land - Native Pastures. Figure 2-36 shows the land uses in the area. As such, the PMLU of low-intensity grazing is consistent with the surrounding land uses, soil types and stakeholder preferences (no stakeholder has raised any objection to the proposed PMLU of low-intensity grazing). Both MLs have been grazed in the past.

4.1.3 Environmental Considerations

Whilst the final PMLU is grazing, the environmental values of the sites and surrounds have been considered.

The post-mining rehabilitated land on Brolga will provide some ecological values. Although some introduced grasses will be planted, and are already established, native grasses and forest species will be included.

Rehabilitation plans include the planting of substantial areas of trees and shrubs in the 'forest' and 'sparse woodland' areas. Seeds will be sown from seed collected from healthy plants growing near to the Brolga ML, and in similar environmental conditions (such as the Canoona ML). This will ensure the plants are better adapted to the local environment which gives the best chance of survival and provides for conservation of local genetic variations.

The forest and sparse woodland revegetation strategy provides shade for stock, windbreaks, habitat for a greater range of fauna, particularly avian fauna; an increase in organic material in soil, increased protection against soil erosion and ultimately a self-sustaining vegetation community.

Careful selection of species will be made to ensure those selected are suitable for primary and secondary succession stages of regrowth in the intended areas. For example, slopes and the edges of overburden dumps will be sown with *Acacia* species (among others). *Acacia* is a fast-growing shrub which is an ideal pioneer species, and grows well on rocky surfaces. Livingstone Shire Council revegetation specialists (who are very familiar with revegetation in serpentine landscapes) will be consulted in the finalisation of species lists.

The final voids are designed for closure as dams. The relevant pits are Pit 1, Pit 2 Extension and Pit 8. The existing dam on the eastern boundary (Dam 4) will remain. All open pits currently have exit ramps which will be preserved in the final landform design. The gradients of the final landform are illustrated in Figure 6-3.

The design has had consideration the direction of drainage. The majority of the rainfall landing on site will be captured on site in existing impoundments to provide for the PMLU of grazing (see Figure 2-12). This will also provide for protection surrounding properties and environmental values during the rehabilitation activities prior to revegetation when water run off is expected to contain more sediment.

The final landform will provide visual amenity that is reasonable for the surrounding area.

4.1.4 Remaining Infrastructure

Existing dams, concrete pads and tracks will be preserved post-mining for use in grazing practices and to assist with sediment and runoff control (see Section 6.6 below). The landholders, QNI, have provided a statement that they will accept responsibility for the infrastructure once mining has ceased (see Appendix 8).

The aforementioned infrastructure will be retained as it is consistent with the low-intensity grazing PMLU. The toilets and showers within the bath-house will be useful for future landholders. The roads will allow for access around the site for management of weeds, fire and cattle. The water infrastructure will allow the water captured on the site to be utilised for pasture irrigation and cattle watering. As demonstrated in Section 2.3.5.4, the quality of the water in these impoundments will be suitable for stock watering and irrigation.

4.2 ML5864 Canoona

ML5864 has had no mining activity other than exploration drill holes. ML 5864 is covered by remnant vegetation (RE 11.11.7 *Eucalyptus fibro*sa) and requires no rehabilitation activity other than fire and weed management. The site has never been cleared but has had some low intensity cattle grazing. Therefore, the PMLU is consistent with how the land was used before the mining activity was carried out on the land. Provided the cattle grazing is kept to a low level, and weed monitoring and management is carried out (particularly for weeds that cattle may spread), the PMLU will deliver a beneficial environmental outcome, as the Canoona ML contains threatened flora and provides habitat values for a range of native species.

No surface or groundwater features are located on the site requiring ongoing management.

The Canoona ML has been verified by an independent ecologist (see Appendix 6) to be successfully rehabilitating on its own and does not require any human intervention other than weed control and fire management. Therefore, the land is in stable condition, no environmental harm is being caused by anything on or in the land, and the land can sustain the PMLU.

4.3 Rehabilitation Areas

A rehabilitation area is defined in the EP Regulation as an area of land in the PMLU to which a rehabilitation milestone for the post-mining use relates. Rehabilitation areas and improvement areas must be based on the proposed rehabilitation or management methodology applicable to the PMLU.

Accordingly, 24 Rehabilitation Areas (RAs) have been defined (see Table 4-1), based upon the methodology described in Section 6.1 and 6.3. Figure 4-1 and Figure 4-2 show the distribution of the RA's.

4.4 Timing of Rehabilitation Activities

The rehabilitation activities (described in Section 6.1 and 6.3) to be applied to each Rehabilitation Area will occur in four stages commencing in 2024. Prior to active rehabilitation, rehabilitation trials will occur for two years (see Section 7.1).

1. The first rehabilitation stage, commencing in 2024, involves undertaking site inspections and confirming removal of infrastructure not being retained, and undertaking contaminated site investigations. Rehabilitation trials (RA1) also commence in 2024.
2. The second rehabilitation stage, commencing in 2024 with surface preparation completed in 2025, is to rehabilitate all pits that have already been partially or fully back-filled (RA2, 3, 4, 5 6 and 7). Their scheduling will allow a large area of land to be rehabilitated without requiring extensive earthworks. Their early establishment will further serve as indicators (in addition to the rehabilitation trials) of the success of the rehabilitation and revegetation methods.
3. The start of the third rehabilitation stage will coincide with the second stage for initial earthworks, commencing in 2025, to start landforming in areas that require time to compact (RA8, 9 and 10 - the Nontronite Stockpile and Go Line Pad). These areas will then be actively rehabilitated from 2027.
4. The fourth rehabilitation stage, commencing in 2028, is to rehabilitate all other areas, including the three pits that are currently open and will become dams (RAs 11, 12, and 15 – Pit 1, Pit 2 Extension and Pit 8) as well as the remaining operational areas (RAs 13, 14, 16, 17 - ROM, Screening Stockpile, Waste Rock Dump and Front Pad) and Dam 4 (expected to be minimal but some stabilisation and revegetation works may be required on or near banks).

A more detailed description of the activities to occur in each rehabilitation area is given in Section 4.5.2 below with reference to the rehabilitation milestones described below in Section 4.5.1. A summary table of the start and finish date for each Rehabilitation Area is included in Table 4-2.

The PRCP Schedule is detailed in Appendix 1.

Table 4-1. Rehabilitation Areas (RAs)

Rehabilitation Area (RA)	RA Name
RA1	Test Pits
RA2	Pit 2
RA3	Pit 3/Oversized Dump
RA4	Pit 4
RA5	Pit 5 North
RA6	Pit 5 South
RA7	Topsoil Dump 2 and Topsoil Dump 3
RA8	Nontronite Stockpile
RA9	Top Pad
RA10	Go Line Pad
RA11	Pit 1
RA12	Pit 8
RA13	ROM
RA14	Screening Stockpile
RA15	Pit 2 Extension
RA16	Waste Rock Dump
RA17	Front Pad
RA18	Topsoil Dumps 1, 4, 5, 6, 7
RA19	Haul Road
RA20	Bath-house Area
RA21	Dam 4
RA22	Brolga
RA23	Canoona
RA24	Water bores

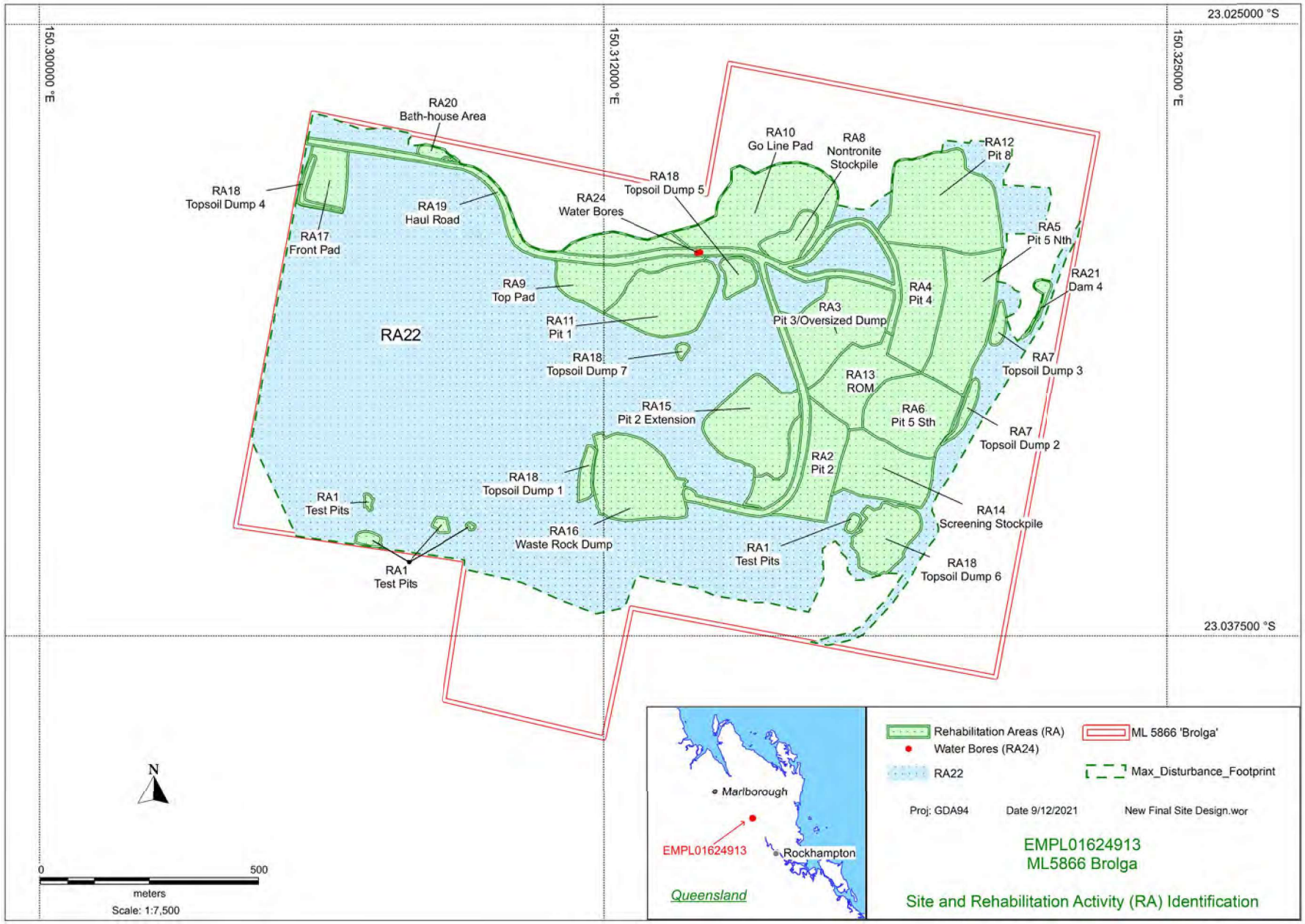


Figure 4-1. Brolga Rehabilitation Areas

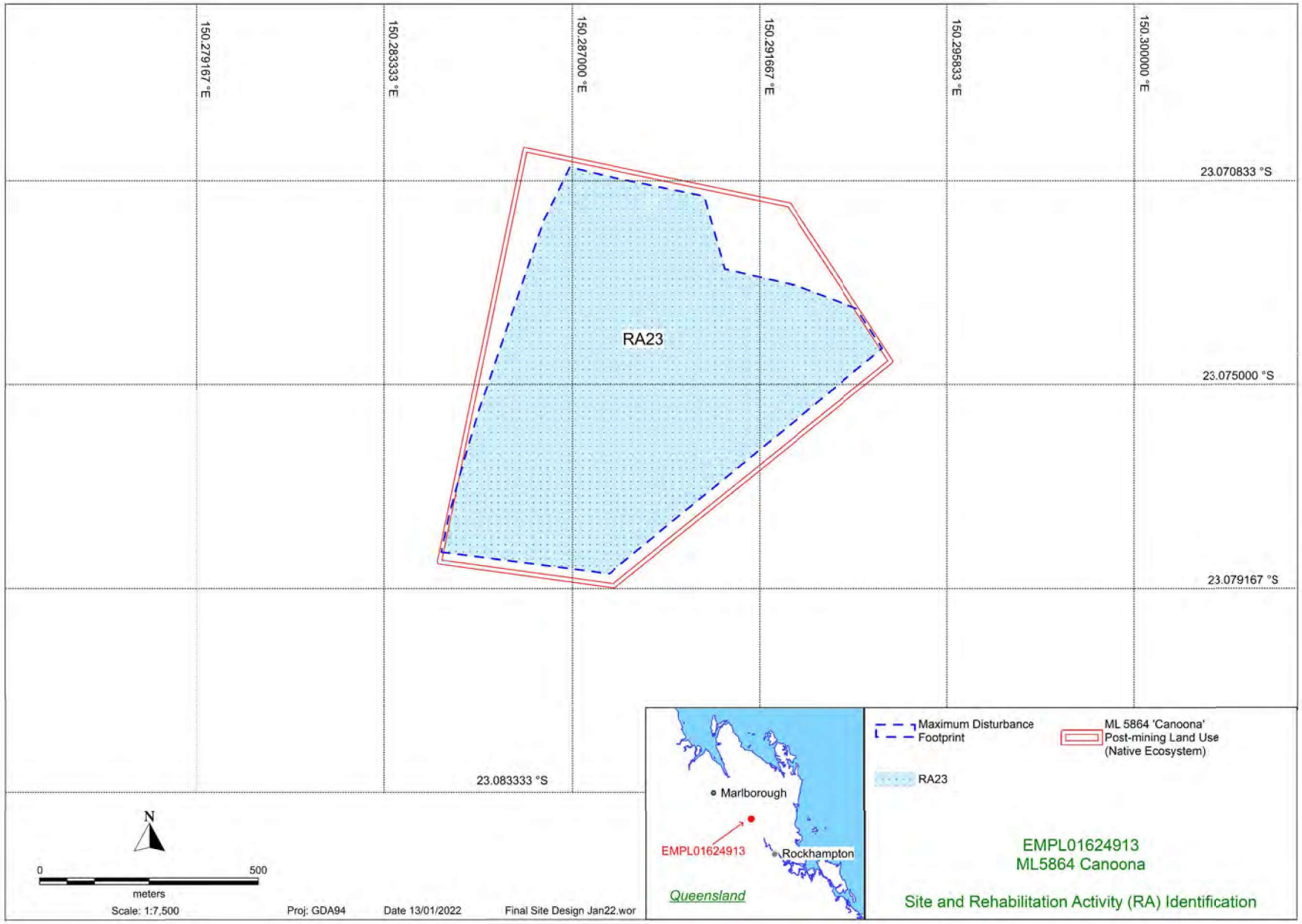


Figure 4-2. Canoona Rehabilitation Area

Table 4-2. Start and Finish Dates for Rehabilitation Areas

Rehabilitation Area (RA)	RA Name	Area (Ha)	Activity Start	Activity Finish
RA1	Test pits	0.45	Feb 2024	Dec 2029[1]
RA2	Pit 2	3.56	Feb 2024	Dec 2029
RA3	Pit 3/Oversized Dump	3.56	Feb 2024	Dec 2029
RA4	Pit 4	2.73	Feb 2024	Dec 2029
RA5	Pit 5 North	3.57	Feb 2024	Dec 2029
RA6	Pit 5 South	3.06	Feb 2024	Dec 2029
RA7	Topsoil Dump 2 and Topsoil Dump 3	0.55	Feb 2024	Dec 2029
RA8	Nontronite Stockpile	0.82	May 2024	Dec 2031
RA9	Top Pad	2.84	May 2024	Dec 2031
RA10	Go Line Pad	4.45	May 2024	Dec 2031
RA11	Pit 1	2.98	May 2024	Dec 2033
RA12	Pit 8	4.92	May 2024	Dec 2033
RA13	ROM	2.43	May 2024	Dec 2033
RA14	Screening Stockpile	2.66	May 2024	Dec 2033
RA15	Pit 2 Extension	3.36	May 2024	Dec 2033
RA16	Waste Rock Dump	3.32	May 2024	Dec 2033
RA17	Front Pad	1.36	May 2024	Dec 2033
RA18	Topsoil Dumps 1, 4, 5, 6, 7	2.88	May 2024	Dec 2033
RA19	Haul Road	4.47	May 2024	Dec 2031
RA20	Bath-house Area	0.19	May 2024	Dec 2031
RA21	Dam 4	0.17	May 2024	Dec 2032
RA22	Brolga	92.97	May 2024	Dec 2028
RA23	Canoona	52.38	May 2024	Dec 2027
RA24	Water bores	0.001	Jan 2029	Dec 2032

1 Note that revegetation will have occurred and establishment will be completed when landforming starts in some of the other areas (RA2-RA7), and vegetation will be established once other areas have started. To allow better understanding of long term effects, RA1 will continue to be monitored until the end of monitoring in all areas (i.e. Dec 2033).

4.5 Rehabilitation Milestones and Criteria

In accordance with the PRCP guideline, milestones, milestone criteria and PMLU completion criteria have been developed that are SMART:

- Specific
- Measurable
- Achievable
- Relevant, and
- Time bound.

4.5.1 Milestones

Each of the Milestones are applied to most of the Rehabilitation Areas. There a few exceptions - the Haul Road (RA19), Bath-house Area (RA20), and the balance of Brolga and Canoona (RA22 and RA23 respectively) which do not require earthworks or revegetation (earthworks for the haul road may be required but would be minor). All other rehabilitation areas require all eight Rehabilitation Milestones to be accomplished, although rehabilitation of the water bores simplifies the final two milestones into one, given their very small area.

The Milestones are described below in Table 4-3.

Milestone completion criteria, rehabilitation indicators and the justification of their relevance are given in Table 4-4 in Section 4.5.2.

Table 4-3. Rehabilitation Milestones

Rehabilitation Milestone	Milestone description	Milestone activities
RM1 Infrastructure and equipment removed and area available for rehabilitation free from contaminants	RM1 seeks to ensure that the area available for rehabilitation is not contaminated, and that all infrastructure not being retained has been removed from the area.	• A visual inspection of the area to confirm the removal of all equipment and infrastructure not being retained on-site, and to document the condition of any infrastructure to remain. As part of this phase, an infrastructure management plan will be prepared detailing all infrastructure to remain on the site after rehabilitation, and the management and maintenance requirements until handover of the site. • A contaminated site investigation prepared by an appropriately qualified person (AQP) and certified by an approved auditor, to contain: - a site investigation report, assessing and making a determination as to whether contamination exists - where contamination is identified, and following remediation of the site, a validation report, describing works undertaken to remediate any contamination found, results of validation testing, and confirmation that contamination is removed or suitably treated or controlled - a site suitability statement, stating that the land is suitable for the intended post-mine land use. • As part of this process, remediation works may be required, which will be undertaken prior to any rehabilitation works commencing in the area. • An assessment shall also be made of the sediment within surface water impoundments, to determine whether these sediments may put meeting the water quality targets at risk. Where this is the case, remediation will be required, which may involve removal (dredging or other removal), and on or off-site disposal and encapsulation, or on or off-site treatment. An assessment report shall be prepared by an AQP, along with certification of the suitability of the impoundments to support the water quality targets, based on the sediment assessment, results of validation testing (if required), and water quality testing. Surface and groundwater testing shall commence from this phase and continue throughout the rehabilitation process.
RM2 Re-shaping landform complete	RM2 involves land shaping and earthworks activities, including detailed design works, undertaking the works, and ensuring that landforms meet the final landform design requirements. It does not include topsoiling.	• Finalise engineering and design plans • Install bunds and other erosion and sediment control system • Bulk earthworks to achieve required landform and slopes

Rehabilitation Milestone	Milestone description	Milestone activities
	All instances of RM2 occur in the dry season, by the end of August.	• General reshaping and pushing/ trimming to achieve final landform • Fill in all voids except for Pit 1 (RA11), Pit 8 (RA12) and Pit 2 Extension (RA15)
RM3 Surface preparation completed	RM3 is surface preparation including surface ripping to relieve soil compaction that could restrict root growth, encourage water infiltration and reduce the risk of erosion; assessment of soil availability and quality; application of subsoil (where required) and topsoils; soil amelioration based on the soil quality assessment, and continued monitoring for erosion and land stability. All instances of this RM occur in the dry season, and are completed by the end of August or September. Most Rehabilitation Activities require topsoiling immediately after the earthworks. One Rehabilitation Area, the Nontronite Stockpile (RA8) is not topsoiled until two years after earthworks, to allow for compaction of the newly-spread rock material.	• Undertake assessments of soil quantity and quality, application requirements • Trim, rock rake and deep rip where required • Spread subsoils where required and topsoil • Soil amelioration as nominated in the assessment above (e.g. fertiliser) • continued monitoring for erosion and land stability • Undertake a check on the recent earthworks and surface preparation works for instability, erosion or other failures • Remediate any erosion or subsidence • Conduct water quality testing to ascertain compliance with trigger limits
RM4 Revegetation	This RM simply refers to the seeding of the area. All seeding (and all instances of this RM) are scheduled in September or October, when spring rain is expected.	• Direct seeding and fertiliser application • Seeds raked in • Application of mulch and fertiliser into sparse woodland revegetation areas • Firebreak maintenance • Continued monitoring for erosion and land stability
RM5 Vegetation is established	This RM refers to a check on the germination success of the most recent seeding. All instances of this RM occur by May-June in the calendar year following seeding. This allows one full wet season for sown seed to germinate, grow and begin to	• Monitoring to determine whether vegetation has established suitably in the revegetation areas • Monitoring to determine whether target species diversity and density meets required criteria • Weed management

Rehabilitation Milestone	Milestone description	Milestone activities
	drop leaves. RM6 includes assessment of vegetation cover and stem density, along with weed surveys and assessment for bare unvegetated patches, to confirm the success of vegetation establishment, and remediate any issues that are identified. Firebreak management and monitoring for erosion and land instability is continued.	• Remediation of any identified shortfalls against the targets • Firebreak maintenance and continued monitoring for erosion and land stability
RM6 Final sustainable landform achieved	Required to determine whether the vegetation regrowth has grown vigorously enough to be grazed, is likely to self-seed in the future, and is mature enough and pervasive enough to prevent erosion of the area, with the objective of confirming that the rehabilitation area has achieved a stable and sustainable condition, and achieves the purpose of the post-mining land use.	Collect evidence to show that the land is safe, structurally stable, does not cause environmental harm and is able to sustain the PMLU. This will include: • An assessment of the carrying capacity of grazing lands • An assessment of land suitability class to provide a final confirmation that the land can be considered to have met the PMLU requirement of low intensity grazing lands. • An assessment of vegetation cover • An assessment of surface water impoundment water quality against targets, and groundwater against the target of no change from baseline • Continued monitoring for erosion and land stability, and monitoring and management of weeds Any rectification activities identified will also be actioned and monitored for success.

4.5.2 Milestone Completion Criteria, Rehabilitation Indicators and Justification

Table 4-4. Milestone completion criteria, rehabilitation indicators and justification

Rehabilitation Milestone	Relevant RAs	Completion Criteria	Rehabilitation Indicators	Justification
RM1 Infrastructure and equipment removed and area available for rehabilitation free from contaminants	All areas	• Confirmation all equipment and infrastructure not being retained for post-mine use has been removed	• Documented visual inspection (including photographs) to confirm all buildings, equipment, machinery and plant not to be retained have been removed	• Site must not contain infrastructure or equipment that requires management or remediation after rehabilitation completed • Only the infrastructure / buildings able to support the post mining land use are to be retained
		• Contamination absent, remediated or suitably treated • Contaminated land site investigation undertaken by an AQP indicates that no contamination unsuitable for the post-mining land use is occurring	• Contaminated site investigation report prepared by an AQP and: - Site suitability statement, stating that area is not contaminated and is suitable for the post-mine land-use of low intensity grazing, OR - Following any required remediation / control works, site management plan completed stating the area is suitable for the post-mine land-use of low intensity grazing	• To ensure a safe and non-polluting site, contamination should be absent or suitably controlled, so that there is no ongoing pollution, safety issues, or contamination of surface or groundwaters
		• Sediment in water impoundments suitable to support long term water quality targets required to achieve the post mine land use	• Investigation report from an AQP that: - Sediments in water impoundments are not contaminated, OR - Sediments have been remediated or removed and disposed of lawfully	• To support long term water quality targets, sediments should not be capable of causing water quality deterioration (outside of water quality targets) or present a long term contamination source
RM2 Re-shaping landform complete	RA2, RA3, RA5, RA6, RA8 RA11-18	• Bulk earthworks completed to final landform design plans confirmed by AQP • All voids backfilled and no impoundments remaining	• Evidence of completion to design plans, including photographs, confirmation survey, and confirmation by an AQP that all final site design specifications met	• To establish a stable condition for land, the final site design specifications must be met to demonstrate final landform stability

Rehabilitation Milestone	Relevant RAs	Completion Criteria	Rehabilitation Indicators	Justification
		other than Pit 1, Pit 2 extension, Pit 8 and Dam 4		• All voids should be filled unless planned to be retained in the final landform design
		• Landform geotechnically stable confirmed by AQP i.e. geotechnical engineer - All embankment slopes ≤15%, or otherwise certified as stable with FoS≥1.5; and - Compaction requirements of final design plan achieved	• Certification from an appropriately qualified geotechnical engineer that: - slopes, including graded banks and waterways, are safe and stable. - material has been suitably compacted, based on an appropriate number of test sites in the field - Predictions / risk assessment completed confirming future long term stability and safety of landform	• Required to confirm the post-mining landform is safe and stable. An existing assessment of slope stability has been conducted (AMEC 2021), which will be confirmed in this phase of the works.
		• Drainage system installed to allow natural non-erosive drainage on the site, and is stable confirmed by survey by AQP • Drainage system installed to final landform design plans, confirmed by survey by an AQP • No active rill, gully or sheet erosion visible within the rehabilitation area	• Site confirmation survey • Certification from an appropriately qualified engineer that drainage systems have been appropriately reinstated • Records of visual inspections that no active rill, gully or sheet erosion is visible in the area	• A long term, stable drainage system has been installed, and no significant erosion is occurring, confirming the suitability of the landform and drainage system. Long term erosion to be controlled after surface preparation and revegetation
		• Safety fencing and signage is in place above all slopes determined to be a potential safety risk to humans or cattle by an AQP	• Certification from an AQP that all slopes do not present a safety risk based on the slope and/or exclusion fencing	• Slopes should be safe and stable, and where potential for fall injury is present, fenced off with appropriate signage installed. This should be undertaken in this milestone stage to protect the safety

Rehabilitation Milestone	Relevant RAs	Completion Criteria	Rehabilitation Indicators	Justification
				of personnel working to rehabilitate the site as well as long term site users.
RM3 Surface preparation completed	All areas except RA19, RA20, RA22, RA23	• Confirmation suitable soil resources are available to complete surface capping and soil establishment	• Assessment report detailing volumetric assessments of available vs required soil volumes, and sources for any makeup volume required	• Confirm that the amount of soil available is suitable to support the proposed works. Note that topsoil application will approximately match the amount of topsoil already removed and stockpiled, and more than sufficient subsoil material is available on-site, and so no soil shortfalls are anticipated.
		• Ripping to minimum 600-750mm at ripper spacing of approximately 1.2m across rehabilitation areas	• Records of visual inspections that surfaces have been appropriately ripped, including photographs	• The ripping and topsoils applications are those set out in the approved land outcome document (Brolga Rehabilitation Management Standard, 2014) • Ripping may be required to encourage root development to a depth that is suitable for vegetation to stabilise soils, minimise erosion and encourage keying in of different soil layers
		• Minimum 500mm subsoil across all rehabilitation areas	• Certification from an AQP that the minimum subsoil depth has been reinstated, or exists prior to topsoiling	• Subsoil and topsoil should be applied at depths that will support plant growth, are practical for application by machinery, and be stable long term (will not blow or wash away)
		• Minimum 100mm topsoil across all rehabilitation areas	• Certification from an AQP that the minimum topsoil depth has been reinstated	
		• Soil health and suitability assessment by AQP confirms topsoil is suitable for seeding and recommends amelioration / fertiliser requirements where necessary	• A soil health and suitability assessment report prepared by an AQP to confirm soil is suitable for target vegetation establishment • Documented confirmation from an AQP that all requirements of the soil health and suitability assessment implemented	• Soil fertility assessments to confirm whether soils are suitable for establishment of target vegetation and to specify any requirements for topsoil amelioration prior to (or during) seeding

Rehabilitation Milestone	Relevant RAs	Completion Criteria	Rehabilitation Indicators	Justification
		• Erosion controls in place to minimise erosion of sub- and topsoils	• Records of visual inspections, including photographs and confirmation that erosion control plans have been implemented	• No active rill, gully or sheet erosion should be visible prior to seeding and revegetation activities • No environmental harm or nuisance should occur due to dust generation • Continued check that the landform and drainage system remains stable and suitable to prevent significant erosion. • Erosion controls in place to protect prepared surfaces
		• No active rill, gully or sheet erosion visible within the rehabilitation area	• Visual inspection (weekly, or as required) by an AQP to confirm there is no active rill, gully, or sheet erosion • No visible dust leaving site that may cause environmental harm or nuisance.	
		• Groundwater quality shows no deterioration from baseline conditions (baseline established from monitoring data collected at bores BB1 and BB2)	• Records of water quality monitoring at established bores for target indicators • Report by an AQP confirming no negative changes to groundwater quality	• Groundwater in monitoring locations remains within expected water quality monitoring limits
RM4 Revegetation	All areas other than RA19, RA20, RA21, RA22, RA23	• Fertiliser at a rate of 100 kg/ha applied to pasture areas, or as otherwise recommended by the soil health and suitability assessment report (RM3)	• Records of fertiliser purchases and use retained, confirming required application rate	• Rates used for rehabilitation of pasture in the local area recommended at 150kg/ha. To be reduced to 100 kg/ha due to the presence of smectite clay in the Brolga soil, as this retains fertiliser much more readily than most grazing soils. Modified if necessary, by soil health assessment.
		• Revegetation of pasture areas with pasture grasses including: - *Chloris gayana* (Rhodes grass) - *Sorghum sp.*, - *Bothriochloa insculpta* (bisset bluegrass),	• Documented visual inspections (including photographs) of revegetation works (weekly, then as required) by an AQP during seeding works	• Seeding rate based on local experience • Inclusion of a legume in a pasture species is recommended by DAF to support establishment of native pastures

Rehabilitation Milestone	Relevant RAs	Completion Criteria	Rehabilitation Indicators	Justification
		- *Heteropogan contortus* (black speargrass), and - *Themeda triandra* (native kangaroo grass) at a rate of 3 kg/ha with 1 kg/ha of Seca seed		
		• Revegetation of grazing areas may include other trees, shrubs and forbs at rates suitable to support the grazing outcome (provide shade and windbreaks) and provide avian habitat. Species used must include: - *Stackhousia tryonii*, - *Acacia leptostachya*, - *Allocasuarina species* (e.g. *Allocasuarina cunninghamiana* and *A. torulosa*); or - *Corymbia xanthope*; - *Eucalyptus fibrosa*; and - other native species from regional ecosystems in the surrounding area	• Documented species to be used, methods of application and rates of seed application • Documented visual inspections (including photographs) of revegetation works (weekly, then as required) by an AQP during seeding works	• Livingstone Shire Council operate a nursery producing native plants of local provenance and have undertaken several restoration projects in serpentine landscapes. Discussions have already been held with them regarding their involvement in the rehabilitation. • Species types, rates and methods of application to be based on local experience (i.e. Livingstone Shire Council experience in serpentinite landscapes) and local seed availability
		• Timing of seeding to coincide with optimal soil and climatic conditions	• Documented advice from an appropriately qualified and experienced persons familiar with revegetation in local area, confirming best timing and conditions for sowing	• Seed failure is a key risk regarding establishment of vegetation by seed. Engagement with local (e.g. local Council) revegetation experts with experience in revegetation in the local area to maximise potential for success. This will

Rehabilitation Milestone	Relevant RAs	Completion Criteria	Rehabilitation Indicators	Justification
				need to coincide with rainfall and/or wet soil to improve germination success, but avoid heavy rains that will wash away sown seeds or seedlings.
		• Seeds raked in to achieve optimal cover following broadcasting	• Documented weekly visual inspections by an AQP during sowing	• Avoids desiccation of seeds or predation by birds
		• Application of mulch and fertiliser into the sparse woodland revegetation areas, at rates recommended at RM3	• Documented visual inspections (including photographs) confirming appropriate application achieved	• The soil in the rocky slopes where the sparse woodland will be revegetated will benefit from amelioration by adding some mulch and fertiliser into and over the soil
		• No active rill, gully or sheet erosion visible within the rehabilitation area	• Visual inspection (weekly, or as required) by an AQP to confirm there is no active rill, gully, or sheet erosion	• Erosion may wash away seeds or seedlings, or otherwise damage topsoils
		• Firebreaks maintained until rehabilitation is complete	• Visual inspections of firebreak by an AQP on a monthly basis	• Firebreaks required as fire could damage re-establishing vegetation
		• Weed presence is at a maximum of 10% of groundcover	• Visual inspections for presence of weeds in revegetation areas	• Weed control and management is an important component of successful rehabilitation as weeds can be a major source of failure of rehabilitation efforts.
RM5 Vegetation is established	All areas other than RA19, RA20, RA21	• Vegetation cover to exceed 50% in pasture areas	• Documented assessment of reference and test sites, measured and recorded by an AQP	• Establishment of target species as defined in the revegetation section of the PRCP (Section 6.1.9)
		• Stem density to exceed the 50th percentile of reference sites for target species in pasture areas		
		• Forest areas and sparse woodland areas contain		

Rehabilitation Milestone	Relevant RAs	Completion Criteria	Rehabilitation Indicators	Justification
		seedlings or suckers (<2m in height) of target woody species at rate exceeding 50th percentile of reference sites		
		• Weed presence is at a maximum of 10% of groundcover	• Percent cover in 10 x 50m plot	• Weed control and management is an important component of successful rehabilitation as weeds can be a major source of failure of rehabilitation efforts
		• No presence of giant ratstail grass or lantana		
		• No exposed topsoil with less than 5% ground cover without remedial seeding in any pasture area	• Documented visual inspection (monthly, or as required) by an AQP	• To minimise the potential for erosion
		• No patches of bare exposed soil (<5% cover of organic litter) exceeding 25m2 in any pasture area		• To minimise the potential for erosion
		• No active rill, gully or sheet erosion visible within the rehabilitation area		• Potential for erosion should be minimised
		• Firebreaks maintained until rehabilitation is complete	• Visual inspections of firebreak by an AQP on a monthly basis	• Firebreaks required as fire could damage re-establishing vegetation
RM6 Final sustainable landform achieved	All areas	• Assessment of carrying capacity by an AQP demonstrates a sustainable grazing outcome is achieved	• Documented assessment of carrying capacity by an AQP, supports low intensity grazing land use	• Confirms that the pasture growth is sufficient to support the PMLU of low intensity grazing
		• Revegetation cover to exceed the 70th percentile among reference sites	• Documented assessment of reference and test sites, measured and recorded by an AQP.	• Confirms that vegetation growth is suitably dense, while allowing for patterns of growth that compare favourably to nearby reference sites

Rehabilitation Milestone	Relevant RAs	Completion Criteria	Rehabilitation Indicators	Justification
		• Land suitability class to meet requirements for final land use of low intensity grazing (Class 4 or better) – at 3 years post revegetation	• Land suitability class measured and certified by an AQP	• Confirms that the land in general is sufficient to support the PMLU of low intensity grazing
		• Surface water quality in impoundments meets the following water quality targets: - pH 6.0 – 9.0 pH units - Electrical Conductivity (EC) 5970 µS/cm - Sulfate as SO_4 1000 mg/L - Fluoride 2mg/L - Total Arsenic 0.5 mg/L - Total Cadmium 0.01 mg/L - Total Chromium 1 mg/L - Total Cobalt 1 mg/L - Total Nickel 1 mg/L	• Records of water quality monitoring for target indicators (identified in conditions of EA) • Report by an AQP confirming water quality meets targets	• Surface water in monitoring locations meets post mining land use water quality targets for low intensity grazing (i.e. livestock watering)
		• Groundwater quality shows no deterioration, compared to baseline data – at 3 years post revegetation (baseline established from monitoring data collected at bores BB1 and BB2).	• Records of water quality monitoring at established bores for target indicators (identified in conditions of EA) • Report by an AQP confirming water quality meets targets	• Groundwater in monitoring locations confirms no deterioration compared to baseline data (as required under EA conditions)
		• No active rill, gully or sheet erosion visible within the rehabilitation area, and all rill or gully erosive features	• Documented visual inspection (including photographs) confirming no rill, gully or sheet erosion features - active or unrectified, and that no other drainage issues remain	• Potential for erosion should be minimised • Drainage should follow defined drainage paths to avoid long term erosion and degradation

Rehabilitation Milestone	Relevant RAs	Completion Criteria	Rehabilitation Indicators	Justification
		rectified – at 3 years post revegetation • Drainage is following appropriate drainage paths and all drainage issues rectified - at 3 years post revegetation		
		• Weed presence is at a maximum of 10% of groundcover • No presence of giant ratstail grass or lantana	• Percent cover in 10 x 50m plot.	• Weed control and management is an important component of successful rehabilitation as weeds can be a major source of failure of rehabilitation efforts.

Table notes:
* An Appropriately Qualified Person (AQP) means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature

4.6 Description of Rehabilitation Activities for each Rehabilitation Area

This section provides a brief description of the rehabilitation activities that will take place in each RA with reference to the rehabilitation milestones described above.

Table 4-5. Description of rehabilitation activities for each rehabilitation area

RA	RA Name	Rehabilitation Activities
Rehabilitation Areas Commencing 2024		
All Areas		A site inspection will be undertaken to confirm removal of all infrastructure and equipment from the site, and confirmation of that to remain. A generalised check of the infrastructure to remain will include preparation of an infrastructure management plan, detailing management, monitoring and maintenance activities to be undertaken for each item. A contaminated site investigation will also be conducted of all areas, to allow for remediation if required prior to rehabilitation works being commenced.
RA1	Test Pits	Rehabilitation and revegetation of the test pits as part of a rehabilitation trial will be conducted early in the rehabilitation program, with revegetation completed and monitoring for establishment, weeds and erosion/drainage issues continuing in the first two years. Following vegetation establishment, final monitoring of the achievement of sustainable landforms will continue until the end of rehabilitation, but continuing throughout to ascertain any issues that may arise after longer time periods.
Rehabilitation Areas Commencing 2025		
RA2 - 4	Pit 2 Pit 3 / Oversized Dump Pit 4	Pit 2, Pit 3 / Oversized Dump and Pit 4 have already been back-filled. Some earthworks are required, namely: • Pit 2 (RA2) - to build a road connection between the Waste Rock Dump (RA16) and the other sections of Haul Road, and to undertake maintenance of the bunds on the eastern and western sides of RA2 • Pit 3 / Oversized Dump (RA3) - to reduce the slope of the eastern wall of the dump to the geotechnical specialist's recommendations, which are a slope of 1.0 vertical on 3.0 horizontal (18 degrees) (AMEC, 2021 – Appendix 11). The existing bund at the top of this eastern wall also requires final reforming. • Pit 4 (RA4) - the existing bunds may require maintenance All these earthworks are to be carried out in the dry season. Surface preparation and topsoiling can follow immediately after checking the stability of the earthworks. Use Topsoil Dumps 2, 3 (RA7) or Topsoil Dump 6 (RA18). Seeding is scheduled for spring, following checks on erosion and stability of the land surface. Germination success and landform stability can be checked during and after the wet season. Monitoring of the area continues until a sustainable post-mining land use is achieved.
RA5, RA6	Pit 5 North Pit 5 South	Pit 5 North and Pit 5 South require some back-filling. Back-fill material can be borrowed from the nearby Screening Stockpile (RA14), the ROM (RA13) or the Waste Rock Dump (RA16). All these earthworks are to be carried out in the dry season. Surface preparation and topsoiling can

RA	RA Name	Rehabilitation Activities
		follow immediately after checking the stability of the earthworks. Use Topsoil Dumps 2 and 3 (RA7). Additional topsoil can be taken from any other topsoil dump. Seeding is scheduled for spring, following checks on erosion and stability of the land surface. Germination success and landform stability can be checked during and after the wet season. Monitoring of the area continues until a sustainable post-mining land use is achieved.
RA7	Topsoil Dump 2 and Topsoil Dump 3	After the topsoiling of RAs 2, 3, 4, 5 and 6, the topsoil remaining on Topsoil Dumps 2 and 3 can be spread over these topsoil dumps in preparation for seeding in the dry season, following a check on the stability of the landform. Seeding is scheduled for spring, following checks on erosion and stability of the land surface. Germination success and landform stability can be checked during and after the wet season. Monitoring of the area continues until a sustainable post-mining land use is achieved.
RA8, RA10	Nontronite Stockpile Go Line Pad	In preparation for rehabilitation works in these areas, initial landforming will be undertaken, to allow for time to settle and compact, before beginning surface preparation and topsoiling works (refer next phase below). Pushing down of the Nontronite Stockpile can be carried out in the dry season. There is an estimated 50,000 cubic metres of stockpiled material to be pushed out over the Go Line Pad (RA10), and some of this material may be used in topping up of subsoil in other areas of the site as required. The objective of the final landform is to form RA10, the Go Line Pad, in a fashion that will make rainwater run-off towards Pit 1. At the Haul Road, a culvert will eventually be installed to preserve this formed road. In the interim, the run-off is to flow across the road, in doing so, ensuring that the culvert is installed in the optimum location. Bunding maintenance may be required along the Haul Road to ensure run-off does not flow northward. It was estimated that if the northern, western and eastern edges of the Go Line Pad have three metres of Nontronite pushed to them, then it would be a simple task to form the remainder of the Nontronite into a gentle slope that will flow to the Haul Road then to Pit 1. If there is too much Nontronite, some can be placed in Pit1 (RA11).
RA22	Brolga	RA22 comprises the balance of areas at Brolga, relating to historical rehabilitation activities. While appearing to be fully rehabilitated, RA22 will be subject to assessments to confirm vegetation is appropriately established over the entire area, followed by monitoring to confirm a sustainable post-mining land use is achieved coinciding with the completion of the remainder of the site. Should rectification works be required as part of the assessment, additional rectification and monitoring works will be conducted, with checks for stability and regrowth vigour scheduled to the end of the wet season.
RA23	Canoona	RA23 comprises the total Canoona site area, which has not been mined and therefore does not require earthworks, topsoiling or revegetation works. Monitoring will be conducted to confirm the final sustainable landform and vegetation is achieved, including weed control works and any rectification of revegetation required, with final monitoring to confirm a sustainable post-mining land use is achieved.
Rehabilitation Areas Commencing 2027		
RA8, RA10	Nontronite Stockpile, Go Line Pad	As noted above, the nontronite stockpile will have been pushed out over RA10, the Go Line Pad, early enough to allow time for the material to settle. Following settlement, and confirmation of stability, some earthworks may be required to attain the final landform shape. The interim drainage pattern described above (flow across the road into Pit 1) will remain until rehabilitation of the Haul Road (RA19).

RA	RA Name	Rehabilitation Activities
		Surface preparation and topsoiling may then be undertaken, using topsoil from Topsoil Dump 5. Seeding is scheduled for spring as pasture, with sloping areas planted with *Acacia* species and forbs, following checks on erosion and stability of the land surface. A fence line is planned for near the crest along the perimeter of the Go Line Pad so livestock do not traverse the slope. Germination success and landform stability can be checked during and after the wet season. Monitoring of the area continues until a sustainable post-mining land use is achieved.
RA9	Top Pad	The only earthworks required for the Top Pad are a renovation of the existing bunding. This includes bunding adjacent to Pit 1. Surface preparation and topsoiling can follow immediately after checking the stability of the earthworks. Topsoil is to be taken from the nearby Topsoil Dump 5 (RA18). Seeding is scheduled for spring, following checks on erosion and stability of the land surface. Germination success and landform stability can be checked during and after the wet season. Monitoring of the area continues until a sustainable post-mining land use is achieved.
Rehabilitation Areas Commencing 2028		
RA11 - RA17	Pit 1 Pit 8 ROM Screening Stockpile Pit 2 Extension Waste Rock Dump Front Pad	Rehabilitation activity on commences in the dry season, with the following works to be completed: • Pit 1 (RA11) - walls on the southern and eastern side are to be re-shaped to conform to a slope of 1.5 horizontal to 1.0 vertical (AMEC, 2021 – Appendix 11). The cut material can be placed in the void at the base of the new batter. A safety bund is to be built at the top of these walls to the specifications recommended in the geotechnical assessment (AMEC, 2021 – Appendix 11). Any spoil piles that remain are to be flattened. Large rocks are to be placed on the north-east corner area, and will become rip-rap to temper the flow energy of run-off from the Go Line Pad. • Pit 8 (RA12) – a check of any instability in the pit walls will identify earthworks requirements, and spoil piles can be flattened and a safety bund is to be built along the perimeter above the uppermost batter. Back-filling of a small excavation located in the south-east corner of the Pit 8 is required. • ROM (RA13) - some reshaping may be required but this may have already been done when the nearby pits were back-filled (RA'S 4, 5 & 6). • Screening Stockpile (RA14) – Some reshaping may be required but this may have already been done when the nearby pits were back-filled (RA'S 4, 5 & 6). • Pit 2 Extension (RA15) – a check of any instability in the pit walls will identify earthworks requirements, and spoil piles can be flattened and a safety bund is to be built along the perimeter above the uppermost batter. • Waste Rock Dump (RA16) - The batters are to be worked to a 1.0 vertical on 3.0 horizontal. A berm is to be formed from the existing rock material along the perimeter above the batter. It is important to maintain the gentle slope to the east that exists on the top of the Waste Rock Dump so run-off flows to the east, rather than towards the berm and batters. • Front Pad (RA17) - Some reshaping of a few spoil piles will be required. Surface preparation and topsoiling can follow immediately after checking the stability of the earthworks. Topsoil is to be taken from the nearby Topsoil Dumps 1, 5, 6 and 7 (RA18).

RA	RA Name	Rehabilitation Activities
		Seeding is scheduled for spring, following checks on erosion and stability of the land surface. Germination success and landform stability can be checked during and after the wet season. Monitoring of the area continues until a sustainable post-mining land use is achieved.
RA18	Topsoil Dumps 1, 5, 6 and 7 (RA18) -	Rehabilitation activity on the Topsoil Dumps commences in the dry season, after all the earthworks on the other Rehabilitation Areas has been carried out. Some drainage patterns may have been affected by the borrowing from the topsoil dumps, so a careful landform assessment is required. Any necessary reforming can be done next followed by surface preparation and spreading of the remaining topsoil. Seeding is scheduled for spring, following checks on erosion and stability of the land surface. Germination success and landform stability can be checked during and after the wet season. Monitoring of the area continues until a sustainable post-mining land use is achieved.
RA21	Dam 4	An initial assessment of Dam 4 conducted during 2024 will be combined with another assessment for stability at the start of this phase, to determine any stabilisation works required, such as for banks and verges. Any areas required to be rectified and revegetated will be undertaken, with revegetation undertaken after monitoring of erosion and stability of the land surface. Ongoing monitoring of stability and vegetative growth (where relevant) is conducted, with final sustainable post-mining land use achieved. This will be confirmed by concurrent water quality monitoring, started in 2024 and continued throughout the rehabilitation process.
Rehabilitation Areas Commencing 2030		
RA19	Haul Road	Rehabilitation Activity on the Haul Road commences in the dry season, timed to allow for other major earthworks and drainage systems associated with other Rehabilitation Areas to be completed, and revegetation underway. The path of drainage from the Go Line Pad to Pit 1 will be known by that time, so the exact location for installation of the culvert will also be known. Rip-rap will be in place at the corner area of Pit 1, to stem the flow of water. No revegetation is required. Monitoring for its sustainability continues until the end of rehabilitation works on the site.
RA20	Bath House Area	Following the initial assessment in 2024 of the management and maintenance requirements for RA20, ongoing maintenance as specified in the infrastructure management plan will have been followed, and the site will be assessed for meeting the sustainable post-mining land use status by the end of rehabilitation works on the site.
RA24	Water bores	Water bores will remain in place during the rehabilitation works to support groundwater monitoring, only being rehabilitated once major works are completed – timed to begin in 2030 and allowing for a year of stabilisation monitoring after rehabilitation. Closure and rehabilitation will involve grouting and removal / cutting off of the casing and capping to ground level. Any disturbed area around the bore will be revegetated by with completion by the end of rehabilitation works on the site.

5 Non-Use Management Area

No non-use management areas (NUMAs) are proposed for either ML.

6 Rehabilitation Management Methodology

6.1 General Rehabilitation Practices

6.1.1 Hydrogeology

As stated in Section 2.3.5.3, groundwaters appear consistent with regional water quality and levels, and local enrichment appears consistent with the serpentinite geology of the area. As no groundwater is intercepted and water tables are deep, ongoing management of groundwater during and post rehabilitation is not anticipated to be needed.

Monitoring will continue throughout the rehabilitation process to confirm that works are not impacting groundwater, with the wells closed and rehabilitated at the end of the works.

6.1.2 Flooding

Flooding in the regional area is likely to occur during the summer months in the local tropical climate. For this reason, earthworks are all proposed for the dry season. Within the mine site, flooding is most likely to be of the 'flash-flooding' kind, where large flows of water could scour areas with inappropriate drainage and/or that have not been stabilised sufficiently.

Strategies to mitigate the effects of flooding include the use of bunds that redirect water flows and drainage design that seeks to minimise flow speed and direct flows to existing stable areas and settlement dams.

The 1% AEP flood extent would not intrude into either ML area. However, extreme event flooding may inundate the final void, Pit 8 (RA12). In such a rain event, Pit 8 will probably be full, providing some mitigation effects for the wider basin. Further discussion of the management of this final void is provided in Section 6.3, with particular reference to flooding in Section 6.3.3.1.

6.1.3 Soil and capping material assessment

6.1.3.1 Quality assessments

An assessment will be undertaken of the suitability of the material contained at the screening stockpile (RA14), the ROM (RA13) and the waste rock dump (RA16) with reference to its use (under the topsoil) to achieve the PMLU vegetation communities of pasture, forest and sparse woodland.

A topsoil assessment must be carried out to determine its suitability to achieve the PMLU vegetation community of grassland, forest and sparse woodland. Considering that the PMLU is that which was previously on the site, it is likely that the quality of the topsoil will be suitable to achieve the PMLU of grazing as well as achieve the forest and sparse woodland areas. Nevertheless, the quality of the topsoil will be assessed to determine the required amounts of ameliorants and fertilisers.

6.1.3.2 Quantity assessments

Topsoil

An inventory of the existing topsoil stockpiles on the Brolga ML was made in 2020, using the drone elevation survey data to confirm volumes, with the results shown in Table 6-1. A total of 66,000 bank cubic metres (bcm) of topsoil is available for use across the site. Figure 6-1 shows the rehabilitation areas of the Brolga ML in terms of their topsoiling requirements, which is also included in Table 6-1. As can be seen, the available topsoil is sufficient to provide for 100mm of topsoil over all required areas of the site.

Note that topsoil to rehabilitate the water bores in RA24 will be stockpiled closed to these areas pending final rehabilitation (since other areas will be rehabilitated prior to this area being initiated), with topsoil likely obtained from the nearby Topsoil Dump 5.

Topsoil is not required for the Candala ML, as no mining activity other than exploration drill holes has occurred on the site.

Table 6-1. Topsoil Inventory

Topsoil Stockpile	Estimated Volume (bcm)
1	4,900
2	1,600
3	4,300
4	3,800
5	11,200
6	39,000
7	1,200
subTotal	***66,000***

Rehabilitation Area Type	Area (m^2)	Depth Required (m)	Volume Required (m^3)
Bathhouse to be retained - topsoil not required	1,896	0	0
Historical disturbance - No topsoil required	928,125	0	0
Haul road to be retained - topsoil not required	44,763	0	0
Dams - topsoil not required. Allow 20% for banks	80,745	0.02 (20% allowance for banks)	1,615
Areas Requiring Topsoiling	408,795	0.1	40,879
	1,464,324		***42,494***
		Net Available	***+23,506***

Subsoil

An assessment of the filling requirements for the pits and other disturbance areas was undertaken in 2020 alongside the topsoil assessment, determining that excess material is present on the site. Available material is described in more detail in Sections 6.1.4 and 6.1.5 below, but equates to approximately 530,000 m^3 of available material, none of which requires treatment in terms of ARD.

An assessment of the site was undertaken based on the drone footage from 2020 and field assessment of available subsoil depths in 2021. The subsoil requirements across the site are shown in Figure 6-2 and summarised in Table 6-2. Note that subsoil will be obtained directly from these areas, or ameliorated prior to use, based on the soil health and suitability assessment.

Table 6-2. Subsoil requirements

Rehabilitation Area Type	Area (m^2)	Depth Required (m)	Volume Required (m^3)
Bathhouse, Dams - no additional subsoil required	82,641	0	0
Haul road to be retained - subsoil not required	44,763	0	0
Historical disturbance - no subsoil required	928,125	0	0
Disturbance areas - sufficient depth of subsoil in-situ	316,239	20% allowance = 0.1	31,624
Areas Requiring Additional Subsoil	92,556	0.5	46,278
subTotal	***1,464,324***		***77,902***



Figure 6-1. Topsoiling requirements, Brolga (ML5866)



Figure 6-2. Subsoil requirements, Brolga (ML5866)

The subsoil requirements equate to around 15% of the 530,000m^3 available, and the 20% allowance for disturbed areas is conservative, since most of these areas incorporate or are made of the available waste material, which is to be reformed, leaving well in excess of the 0.5m depth required in most areas.

An additional assessment stage has been included to provide final confirmation of fill material volumes to fine tune the movement of material, particularly topsoil, across the site to achieve the required 100mm minimum topsoiling depth.

The depth of topsoil used needs to be suitable for the adequate establishment of the target vegetation. In general, a depth of between 150 mm and 300 mm is acceptable (DME 1995), however, shallower depths, such as the 100 mm proposed for the Brolga ML, are adequate where soils are expected to have good water holding capacity and inherent fertility - pre-existing topsoils were approximately 100mm deep.

6.1.4 Waste and other materials characterisation

The various overburden and ore dumps are comprised of material that can be considered to be either Waste, Ore, Low-grade Ore or Nontronite. Table 6-3 below itemises each structure's material. Waste Rock Dump, Top Pad and Go-Line Pad are Waste. The Nontronite stockpile is considered to be Waste in this context. The Front Pad is Low-grade Ore. The ROM and Screening Stockpile are Ore.

Table 6-3. Origin of Excavated Material

Structure	Category	Comments
Screening stockpile	Low-grade Ore	Excavated ore ready for screening
ROM	Ore	Where ore is stockpiled for screening and loading
Waste Rock Dump	Waste	Exclusively Waste Rock
Nontronite stockpile	Nontronite	High nickel content which cannot be refined. Stockpiled on the Go-Line Pad.
Top pad	Waste	Parking, turn-around and pit exit point.
Go-Line Pad	Waste	Area used for parking and the Nontronite Stockpile
Front pad	Low-grade Ore	An area originally used for stockpiling and parking of machinery

6.1.4.1 Low-Grade Ore

Because the nickel content of the ore from the Brolga Mine is quite low (by world standards), highly variable in content and transitional in grade within the deposit, a substantial volume of 'ore' is considered to be low-grade. The low-grade ore is neither worthless nor valuable. However, it was given a much lower priority for transport to the refinery. For this reason, it was stockpiled separately and used when higher grade ore could not be mined or was blended with high grade screened ore.

6.1.4.2 Waste Rock Dump

The Waste Rock Dump (WRD1) is a structure built using waste material (overburden) extracted from mainly Pit 1 and Pit 2. This overburden to the ore was comprised of the upper two layers of the lateritic profile (the ferricrete, and transitional 'Limonite' Zone). These upper zones of the lateritic profile that were extracted to form Waste Rock Dump (WRD1).

The description of this material is:

- Ferricrete; the suface layer, is the uppermost lateritic layer. It has been depleted of nickel, magnesium and cobalt. It is typically red-brown and variable in thickness. It is a residuum of oxidised serpentinite. Its typical mineral composition is iron-oxides (haematite and goethite), silica (as quartz, chalcedony and chrysoprase) and kaolinite clay. The iron-oxides occur as pisolites, nodules, mineral coatings and concretions. It is always treated as waste material.
- Transitional 'limonite' which is the zone that contains intercalations of the yellowish-brown zone and pale-cream coloured parts of the siliceous zone. It contains mainly light-brown to brown stained silica, limonite, and some kaolinite clay, greatly enriched in silica minerals. It is typically a brown to yellowish-brown colour. It is always treated as waste material.

Fragment sizes and shapes in Waste Rock Dump (WRD1) are highly variable, from clay-sized particles to naturally cemented aggregates up to 50 cm across. Mineralogically, it contains a mixture of iron and aluminium oxides and hydroxides, clay, and silica as quartz and chalcedony. The material is invariably highly-weathered, having been extracted from the lateritic layers that form as a result of deep tropical climate weathering.

6.1.4.3 Go Line Pad

The Go-Line Pad is essentially the same material as that in the Waste Rock Dump (WRD1), being a mixture of the upper lateritic ferruginous layer and the top part of the next lateritic layer, where it transitions to the pale brown limonitic layer and cream a yellowish-brown siliceous zone. The Go Line Pad has compacted well, but suffers from erosional scouring on its slopes, therefore requires some pushing down of areas at the perimeter and vegetating to reduce the probability of generating sediment-charged run-off water. At its maximum height, the Go Line Pad is ten metres thick.

6.1.4.4 Top Pad

The Top Pad is also a mixture of the upper lateritic layers, mainly the ferricrete zone but with some of the paler limonitic zone. Much of the Top Pad is exposed ferruginous laterite that has been flattened and pushed northwards and outwards to the flanks of the pre-existing landform by dozers and graders to form a relatively flat area. The remainder and majority of the Top Pad area is 'cut and smoothed' from the pre-existing landform.

6.1.4.5 Nontronite Stockpile

The Nontronite Stockpile is entirely comprised of rock mined from the saprolitic laterite layer, and has a nickel content similar to the ore grade. Most of the nickel in this stockpile is in the smectite clay mineral known as nontronite, with a smaller proportion within nickel-oxides. Mine product that had a high proportion of nontronite was found to yield much less nickel during the refinery process, and so this type of product was stockpiled until a modified refining process could be devised, or the planned Gladstone Pacific Nickel Refinery was developed. The area called the Go Line Pad has been used to stockpile this 'potential ore' (it is not a low-grade ore).

The nontronite stockpile has been screened to pass 200 mm screens, and it has a highly variable proportion and range of grain sizes. Although a proportion is clay material, the majority of the material is rock aggregates cemented by silica, with aggregate sizes to 200 mm. It includes substantial proportions of silica (as chert and chalcedony), kaolinite and nontronite.

6.1.4.6 Geochemical analysis

The region's geology, ore body formation, GNP SEIS static testing (refer Appendix 9), regional water quality data and site rehabilitation performance following 28 years of mining on the mining lease all demonstrate that ARD is not present in the mining horizon or a potential threat with mining. The ore has a high ANC and is capable of being used to neutralize ARD in other waste. This is explained in Section 2.3.7.

The Marlborough ore was classified as Non-Acid Forming (NAF) due to the lack of oxidisable sulphur, a negative NAPP, and NAG pH values above 4.5.

6.1.5 Landform design

6.1.5.1 Brolga (ML5866)

The final landform design was determined using the continuation of strategies that have been used since mining recommenced in 2014. The former land reshaping, which occurred during the mining stages of the Project, was undertaken with the PMLU of grazing in mind. As such, the spoil dumps were formed into gently sloping terraced landforms to be suitable for grazing, and as a strategy to ensure stability. All open pits currently have ramps, which will be preserved in the proposed final landform.

The final landform design seeks to build on the former land reshaping, using the following criteria:

- Existing back-filling of pits is carried out with a view to creating a terraced landform. This suits the post-mining land use, while also mitigating vulnerability to erosion.
- Direct flows away from vulnerable slopes. This strategy has been built into the proposed rehabilitation works of the Go Line Pad (RA10), Waste Rock Dump (RA16) and by the installation of existing and proposed bunding.
- Conversion of final voids into dams for the post-mining land use. The strategy adopted for the final voids results in a water storage system that is unlikely to become depleted, but also avoids reliance upon a single, large dam whose stability might be compromised by its size. It also prevents the degradation and erosion that may eventuate from having a single dam overused by the daily visits of livestock.
- Use of local vegetation species that are adapted to the soil type, and pasture species that are successful in the local area.

The final landform design is shown in Figure 6-3 and Figure 6-4.

Geotechnical considerations

The post mining landform design has incorporated the following geotechnical criteria. These criteria are based upon the recommendations of a geotechnical specialist, which are documented in the report 'Geotechnical Assessment of the Brolga Project, QNI Resources Pty Ltd' (AMEC, 2021) - Appendix 11 of this PRCP.

- Integrate waste dumps and back-filled pits with the surrounding landform
- Waste dump batters maximum slope 1.0 vertical on 3.0 horizontal
- Contour banks installed on waste dump batters when the slope length is greater than 30m
- Residual void batters to be laid back to 25° maximum slope where possible, unless a geotechnical expert advises that the angle can be greater.

Geotechnical factors of disturbance features were assessed in consideration of stability. The disturbance features assessed included particular inspection of the three final voids (Pit 1, Pit 2 Extension and Pit 8) and the structures built from overburden and other waste rock (Go Line Pad, Nontronite Stockpile, Waste Rock Dump, Front Pad and Top Pad. As mentioned above, a geotechnical specialist provided an independent assessment and recommendations (AMEC, 2021). The outcome of these assessments and inspections are discussed below.

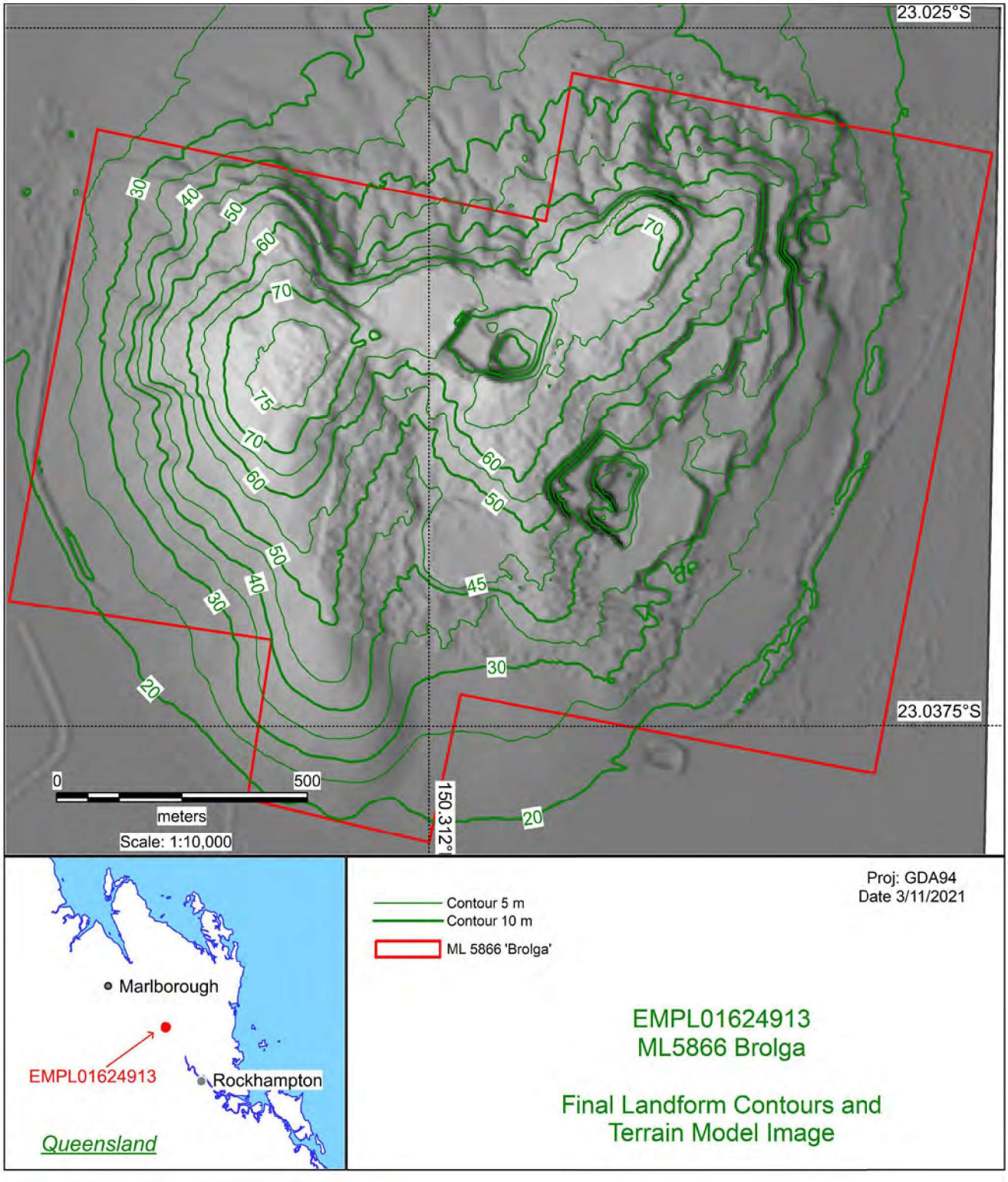


Figure 6-3. Final Landform Contour Map – Brolga (ML5866)

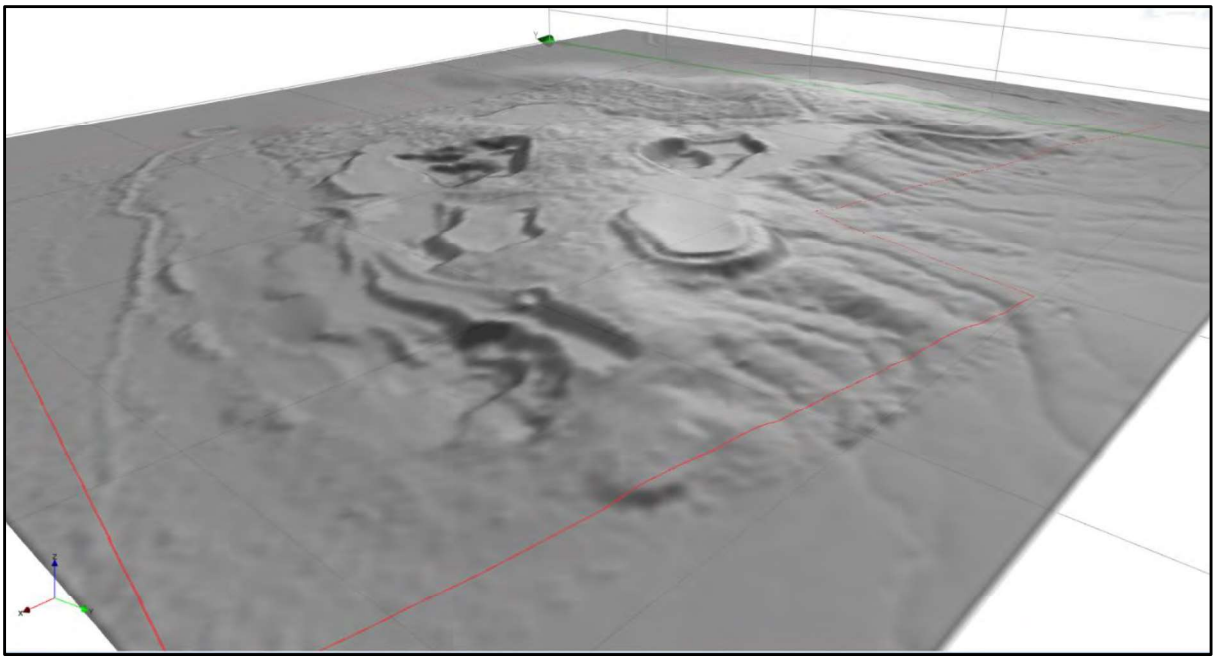


Figure 6-4. Final Landform Perspective view from the north-east – Brolga (ML5866)

Pit 2 Extension (RA15) and Pit 8 (RA12)

The exposed pit walls in Pit 2 Extension are comprised of strong rock and do not contain any swelling clay or soft rock, nor show any signs of mass wasting or failure of any kind. Geotechnical specialist's advice for Pit 2 Extension (RA15) determined that the pit walls are strong and stable, and included recommendations that a safety berm be installed along the top of the pit walls, and in-pit spoil piles be flattened. These recommendations have been incorporated into the rehabilitation works for RA15.

Pit 1 (RA11)

There are two walls of Pit 1 that require additional earthworks to ensure their stability. These are the eastern and southern walls of Pit 1. Geotechnical specialist's recommendations are that these pit walls must be modified to a constant slope ratio of 1.0 vertical on 1.5 horizontal. These recommendations have been incorporated into the rehabilitation works.

There is a considerable proportion of smectite clay in the walls of Pit 1, which causes them to swell and erode into the pit. Currently they are benched, and there is an apparent gradual accumulation of wasted material along the berms.

The cut material from the benching is to be placed at the base of the walls, in the void. The current topography immediately adjacent to these two walls will be modified by the installation of a safety berm built ten metres away from the pit crest. This will ensure that rainwater run-off continues to flow away from the pit, and minimise the amount of water that enters the pit causing the clay to swell.

The western and northern walls have already been graded back and have a large amount of back-fill at their bases to ensure their stability.

Waste Rock Dump (RA16)

The Waste Rock Dump was built using overburden waste rock. The geotechnical specialist's recommendation was that the batters are reshaped to a slope of 1.0 vertical on 3.0 horizontal. These recommendations have been incorporated into the rehabilitation works.

Pit 3/Oversized Dump (RA3)

Pit 3/Oversized Dump was built by back-filling Pit 3 with waste rock screened from run-of-mine ore. The geotechnical specialist's recommendation was that the batters be reshaped to a slope of 1.0 vertical on 3.0 horizontal; and that a safety berm be built along the crest. These recommendations have been incorporated into the rehabilitation works.

Materials Available

Bulk fill material is proposed to be taken from the screening stockpile (RA14), the ROM (RA13) and the waste rock dump (RA16). Table 6-4 below lists the volume of the material in each dump structure. No treatment is required in terms of ARD (see Section 6.1.4).

Table 6-4. Overburden and Ore Dump Volumes

Disturbance	Volume (m3)	Volume (t)
Screening Stockpile	19,940	25,900
ROM	29,700	38,620
Waste Rock Dump	196,800	255,800
Nontronite Stockpile	51,425	66,800
Top Pad	1,200	1,560
Go line Pad	231,300	300,700
Front Pad	1,620	2,100
subTotal	***531,985***	***691,480***

6.1.5.2 Canoona (ML5864)

The current layout at the Canoona site will not require alteration as part of finalising the rehabilitation works. As such, the final landform will be the same as the existing landform, as shown in Figure 2-6 and Figure 2-7.

6.1.6 Cover design

Soils assessments will be undertaken prior to application to ensure the proposed material and soils are suitable to achieve the PMLU.

Subsoils (and other secondary growth media) will then be spread across the scarified profiled landform at a nominal depth of around 500 mm. Topsoil (and other suitable primary growth mediums if identified as being required) will then be spread over the subsoil to a nominal depth of 100 mm. Fertiliser and/or hay mulch will also be applied, as necessary. Section 6.1.9 gives more details.

6.1.7 Water management

The mine area contains no rock minerals or introduced substances that are likely to contaminate the receiving environment (refer to Section 6.1.4 which presents the geochemical characteristic of the rock). Catchments and waterways of the proposed final landform are illustrated in Figure 6-5.

As described in Section 2.3.5.3, groundwater is not intercepted on the site, and the only locations that may hold water will be retained as dams. Given there are no other excavations proposed, no

dewatering will be required. Catchments and sub-catchments that flow to the final voids are also limited in size, further limiting the potential for any overflows, which can be controlled by use of the water in irrigation and livestock use, and which are directed and captured in any case by downstream dams.

The high water holding capacity of the upper layers of soils will also benefit revegetation efforts, and limits problems related to seepage, which is also partly due to the tempering of flow rates through the low permeability rocks. The high strength of the saprolitic layer's rocks is not compromised by the water seepage. Some problems have occurred where there is a high smectite clay content, for example in the walls of Pit 1, which have been addressed in the final design (refer Section 6.1.5).

Surface water diversions have been included into the designs of existing back-filling operations, in the form of bunding that directs water along the contour, rather than down. This has resulted in slow run-off velocities and the settlement of sediment from the slowly flowing water. This practice is continued in the proposed design of the final landform.

The existing back-filling has resulted in a terraced landform, which further reduces run-off velocity. The haul road includes bunds wherever sediment was seen to leave the road in volumes and rates too high.

In the final landform, Pit 1 will receive run-off from the catchment shown in Figure 6-5. The catchment includes only the Go Line Pad and some of the Top Pad and adjacent haul road. Run-off from the Go Line Pad will pass through a culvert that is to be installed. In the final landform, any outflow from Pit 1 (minimal if at all) would flow across established vegetation, southward along a natural gully, into Dam 3. Water quality would be consistent with that in the surrounding farm dams (including Dams 1, 2 and 3), which meets the water quality targets for this PRCP [and as specified in the EA] – refer Section 2.3.5.4).

Go Line Pad (RA10) and the Nontronite Stockpile (RA8)

Rehabilitation works for the Nontronite Stockpile include pushing this stockpile down, across the Go Line Pad. The final landform has been designed to force run-off to flow from the newly fashioned Go Line Pad to the haul road near Pit 1. This is to prevent run-off scouring the walls of the Go Line Pad. It also adds a modest catchment area to the watershed of Pit 1, which will become a dam for the post-mining land use. The extent of the catchment is illustrated in Figure 6-5. A berm has already been installed along the haul road to prevent run-off from this area flowing northward.

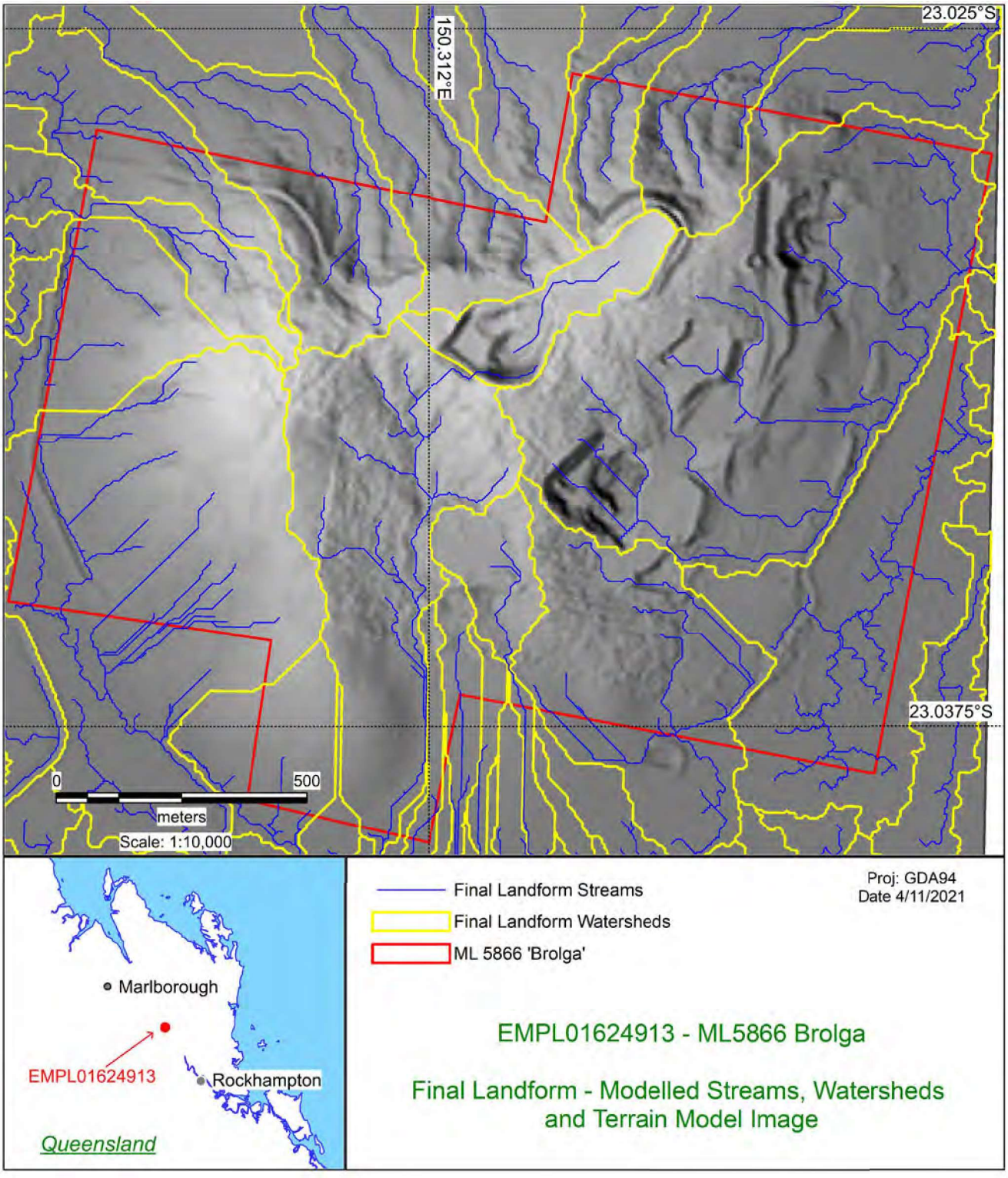


Figure 6-5. Final Landform, Watersheds and Waterways

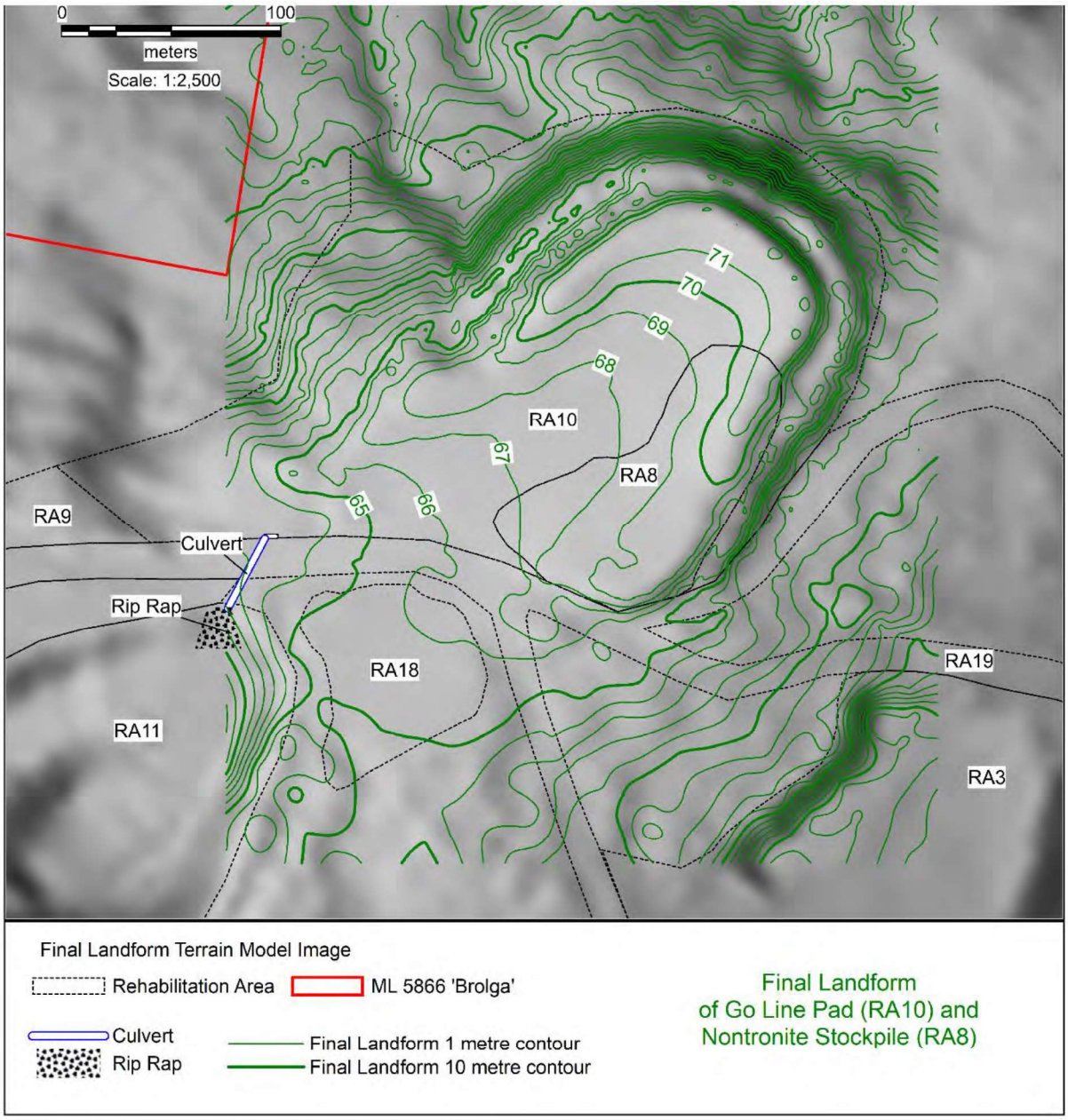


Figure 6-6. Final Landform – Go Line Pad (RA10)

6.1.8 Erosion and Sediment, Dust Control

6.1.8.1 Erosion and Sediment Control

An erosion and sediment control plan will be developed as part of the detailed engineering design plans. Measures will include the following:

- ripping and contouring to reduce runoff / enhance infiltration
- drainage control to divert runoff into pits for settlement of sediment
- undertaking works in the dry season, with revegetation before the wet season to protect soils from rain drop dispersion and surface erosion.

Additional (small) silt traps may also be constructed where considered necessary to reduce sediment inflows to dams or other areas, routinely emptied to maintain sediment trapping capacity. The

existing dams are part of sediment and erosion control measures under the EA, and form part of an existing Site Water Management Plan (under the EA).

6.1.8.2 Dust Control

The specific activities that have the potential to generate particulate emissions during rehabilitation activities are:

- Backfilling and Contouring
- Ripping
- Topsoil spreading
- Wheel generated dust from other vehicles on unpaved road
- Vehicle exhausts.

Dust emissions may vary according to the following factors:

- Overburden and topsoil stockpile and properties (location, moisture content, extent of stockpile)
- The earthmoving activities occurring
- Prevailing meteorological conditions
- The amount of the site vegetated.

The nearest receptors to the mine site are rural residences located 1.5 kilometres north of the site and 2.5 kilometres to the south-west of the site. Air emissions from rehabilitation activities at the Brolga ML are not expected to create any public nuisance or health concerns. It is acknowledged that there is, however, potential for there to be minor impacts on local visual amenity in times of low rainfall and higher wind speed where airborne particulate matter travels further. As such, the rehabilitation activities will have reference to the dust control initiatives set out in the Brolga Environmental Management Plan. These initiatives are tailored to address the higher risk periods, with greater focus on watering of haul roads and the use of dust suppression controls on stockpiles, and include the following control strategies:

- Haul roads and other unsealed roads will be watered, as appropriate
- Planning in advance of bulk earthworks to minimise handling, drop heights and wind erosion, where practicable
- Minimise the area of land disturbed at any one time
- Vehicles will travel in accordance with set speed limits
- Ongoing maintenance of roads will be undertaken to ensure they are in good condition
- Implementation of a dust monitoring program to monitor dust deposition at the lease boundary
- Appropriate awareness training for relevant personnel.

6.1.9 Revegetation

With the PMLU being grazing, three types of seeding mix (pasture, forest and woodland) will be used to revegetate the rehabilitation areas. A PMLU of grazing requires both pasture and forest. Livestock utilise forest as a means of protection from weather, especially wind, and as a protection from perceived predators. Cattle also commonly retreat to forested areas (if available) in the later part of the day to ruminate. Sparse woodland is the forest type that is planned for some pit walls and rocky batters because pasture and forest are not suitable to these landforms.

Pasture species will be sown on the gentle slopes and terraces; forest species will be used on moderate slopes and in groves considered to be in ideal locations for livestock shelter. Particular use of *Acacia* species will be used to revegetate rocky slopes and batters to a sparse woodland forest type. Early revegetation trials will determine whether the topsoil reserves still contain a range of viable seed.

6.1.9.1 Pasture Areas

Seed mixes for the pasture will include the pasture grasses *Chloris gayana* (Rhodes grass), *Sorghum* sp., *Bothriochloa insculpta* (bisset bluegrass), *Heteropogan contortus* (black speargrass) and *Themeda triandra* (native kangaroo grass). Inclusion of a legume in pasture mixes is recommended by the Queensland Department of Agriculture and Fisheries (DAF). Seca is considered to be a good choice for the Brolga area. It is commonly used in central Queensland, and will provide high quality protein forage during winter, when the grasses are stressed.

For the pastures, three kilograms of total grass seed per hectare is recommended, with one kilogram of Seca seed. Fertiliser rates are commonly recommended at around 150 kilograms per hectare, but with the presence of smectite clay in the Brolga soil, this fertiliser rate should be reduced to about 100 kg/ha, as it retains fertiliser much more readily than most grazing soils. Subsoil and topsoil assessments will be undertaken to determine the required amounts of ameliorants and fertilisers.

6.1.9.2 Forest Areas

For the forest species, some seed is likely to be preserved in the existing topsoil reserves. Additional seed can be sourced from established regrowth elsewhere on the mine site, and from remnant forest that is common in the immediate area.

'Eucalyptus fibrosa subsp. fibrosa, Corymbia xanthope woodland on serpentinite forest' (RE 11.11.7 -– see Section 2.3.9) is the vegetation community chosen for the eventual forested areas. Its particular adaption to the serpentine soil type cannot be overlooked in consideration of alternatives. This soil type supports a number of serpentine endemics (Batianoff and Singh, 2001).

Suitable species for revegetation include the nitrogen fixing species *Stackhousia tryonii, Acacia leptostachya* and *Allocasuarina* species (e.g. *Allocasuarina cunninghamiana* and *A. torulosa*). These will help to improve the soil. Other species to be used include *Corymbia xanthope* and *Eucalyptus fibrosa.* A suitable species list will be developed in consultation with Livingstone Shire Council (who operate a nursery producing native plants of local provenance, and have undertaken several restoration projects in serpentine landscapes [pers. comm, P. Delalande & L. Childs, LSC, February 2022]).

Seeding rates for this vegetation type are not proposed in this report. Seeding rates will be governed by seed availability and collectability from forests on neighbouring properties. Hundreds of seeds are in even a few grams of gum nuts, however availability can differ from species to species, and year to year, so collection should be commenced as soon as possible.

6.1.9.3 Sparse Woodland

Rocky slopes, like the walls of overburden dumps and some pit walls, will be revegetated by sowing *Acacia* species and any forb that is collectable from nearby forest, into soil cast over scattered areas. Some grass seed is to be included to retain soil, but the intention is not to make pasture on these slopes. The soil in these areas will benefit from amelioration by adding some mulch and fertiliser into and over the soil. *Acacia* is a robust enough seedling to penetrate mulch. It already colonises the rocky slopes in the Brolga mine area. The mulch is required to prevent the soil drying out as the

rocks create a hot micro-habitat. Water seepage will maintain moisture availability during the wet season.

6.1.9.4 Soil Spreading and Seeding Practices

The characteristics of the soil are discussed in Section 2.3.6 of this PRCP. As specified in that Section, between 10 and 15 cm of topsoil was scraped, implying that there is an average of 100 mm of topsoil available to applied to all areas. A minimum topsoil depth of 100 mm will be applied, overlying a minimum 0.5m of subsoil, either in-situ or topped up to achieve the minimum 0.5m, to reinstate the former land surface. A soils assessment will be conducted of each stockpile prior to use to confirm the fertiliser and other amelioration requirements. The topsoil assessments will also confirm whether the soil resources available are sufficient for the revegetation.

Spreading of regolith and then topsoil will take place during the dry season, in winter (from May to August) in all RA's, in accordance with the Rehabilitation Schedule. This practice will allow time for it to settle and make apparent any erosion or instability that may eventuate. Precipitation events during the dry season, if any, are unlikely to be stormy or high rainfall events.

Monitoring of landform stability and revegetation success will be ongoing, but concentrated in the summer months. All rehabilitation activities will follow this seasonal temporal pattern in the Rehabilitation Schedule.

Seeding will be carried out in spring, September and October, to increase chance of seedling success from the seasonal rainfall. Ideally, seeding will be carried out after at least one spring rain event, and after that rain has had some time to evaporate and infiltrate, to leave an ideal soil moisture content for seed germination. Consideration must be given to moisture content so that sown seed does not become embedded in the concretions that are likely to form after rain, a characteristic of this soil type.

Monitoring of 'La Nina' weather conditions is a reliable forecasting technique in the timing for seed sowing. 'La Nina' conditions are an indicator that rain will fall during the coming year. They are predicted using oceanic surface temperature in the eastern Pacific Ocean. When a cool ocean surface exists, the consequent easterly wind across the Pacific Ocean is stronger and denser than normal, resulting in increased severity and frequency of rain events in the western Pacific regions. If a 'La Nina' year is predicted, sowing can be scheduled earlier because early spring rain is likely.

The conservation area which was designated in the Land Outcome document 'Brolga Rehabilitation Management Standard' (Appendix 3) has been undisturbed and therefore no rehabilitation is necessary (however checks will be performed to verify that the condition of the vegetation is consistent with that specified in this PRCP). A study undertaken in 2012 (see Appendix 12) demonstrated that, at that time, rehabilitation was well under way, with ground cover across the site above 50%. The weed control practices previously undertaken will continue in this area.

6.1.9.5 Soil Amelioration

The growth media does not necessarily require amelioration, as it usually contains sufficient smectite clay to retain moisture and nutrient, is friable enough when moist to facilitate germination, and provides sufficient seed-soil contact to promote seedling growth. However, amelioration of soil will be used in pasture grass sowing in the form of low-moderate fertiliser rates, and on the steep rocky slopes in the form of some mulch for sowing of *Acacia* spp.

A modest degree of topsoil amelioration by the addition of mulched plant material and a small amount of fertiliser is proposed for areas that have little or no friable regolith, like batters, berms

and other rocky ground. This is likely to increase seedling survival on the rocky ground which would otherwise dry out soil which is not ameliorated.

Amelioration of the soil by mulch is not proposed for the pasture areas (on terraced and gently sloping landforms).

Soils assessments will be undertaken prior to application to verify, or amend as required, the proposed amelioration measures to ensure that the proposed material and soils are suitable to achieve the PMLU.

6.1.9.6 Batters, Berms and Pit Walls

Along batters, berms and pit walls, topsoil spreading will not be pervasively or evenly spread. It is impractical to do this. Seeding will consist primarily of shrubs and forbs collected from neighbouring forests, plus any remnant seed bank which may persist in the topsoil reserves. Pioneer species like *Acacia* have already colonised and grown vigorously on existing pit walls, batters and berms.

6.1.9.7 Terraced landforms

Terraced landforms and gently sloping land will have three kilograms per hectare of grass seed added, and one kilogram of Seca, with a view to the post-mining land use, grazing. Soil will be spread relatively uniformly in these areas. Some groves of forest will also be sown.

6.1.9.8 Weed management

Weed control and management is an important component of successful rehabilitation as weeds can be a major source of failure of rehabilitation efforts. As such, it is critical that any new weed infestations are prevented and/or controlled at the earliest possible opportunity.

In addition, QNI is obliged under the *Biosecurity Act 2014* to prevent the spread of declared weeds. Three species observed on the MLs are declared category 3 weeds under this Act - American rat's tail grass (*Sporobolus jacquemontia*), giant rat's tail grass (*Sporobolus pyramidalis)* and lantana (*Lantana camara*). The Act requires everyone to take all reasonable and practical measures to minimise the biosecurity risks associated with invasive plants under their control. Some non-declared weeds can also severely impair the successful development of rehabilitation. It is therefore important to identify and prioritise the weed species of concern and set out their management requirements.

Priority will be given to management of weed species that have the highest risk of severely impairing the success of rehabilitation. Currently, of the weed species identified at the Brolga mine, giant rat's tail grass is the highest priority species for management. Lantana has been identified as the second highest priority weed species for management. Priorities should be reviewed annually, and be informed by monitoring.

Management should have reference to the management practices set out in the factsheets – rat's tail grasses (DAF, 2021) and lantana (DAF, 202) and other governmental factsheets relevant to other weed species identified.

6.1.9.9 Fire management

Brolga

Bushfires need to be excluded from the Brolga ML site to allow the success of pasture as the final land cover for grazing post-mining. The bushfire risk has two main sources: neighbouring properties; and activities on site.

Fire controls such as firebreaks will be maintained along fence lines where there is a high fuel load to protect the property from any neighbouring fires.

Activities on-site will be risk-managed so that if a fire risk is identified the activity can be modified or controlled in an appropriate way to avoid fire ignition.

The site has an Emergency Response Plan (QN-PLN-002) which is applicable to the Brolga ML.

Canoona

Canoona is intended for very low intensity grazing in a manner that preserves the structure and condition of the Regional Ecosystem on site.

For Canoona the fire management guidelines for RE 11.11.7 should be followed. These guidelines are given as part of the Regional Ecosystem description for that RE type (DES, 2022) and are as follows:

- SEASON: Burn early dry season when there is good soil moisture, with some later fires in the early storm season or after good spring rains.
- INTENSITY: Various.
- INTERVAL: Most intervals between five to ten years, with no shrubby woodlands receiving two consecutive intervals of < six years.
- STRATEGY: Once boundaries of the planned burning area are secure, ignite across the landscape in a patchwork, rather than continuous ignition strips. Use topographical features to help create a patchily burnt landscape. Where shrubby woodlands occur within a broader grassy landscape, attempt to burn the shrubby woodland during every second fire rotation in the grassy woodland, by burning early breaks around the shrubby areas. In sites with a history of wildfires recurring within 5 years, patchy burning in a few small strategic locations at three or four year intervals may reduce the incidence of extensive wildfires, while ensuring most shrubby woodland areas remain unburnt for > 5 years.
- ISSUES: Shrubby woodlands require longer fire intervals than grassy woodlands, because of the presence of fire-killed shrubs and the time required for post-fire regrowth to return to a mature structure. The seedlings of many fire-killed shrubs (such as some wattles) require fire years or more before they mature. The creation of a fine-scale patchy mosaic can be more difficult to achieve in shrubby compared to grassy woodlands. Ensure seedlings of fire-killed shrubs mature and persist in the woodland; ensure several years of mature shrubby woodland structure before the subsequent fire.

6.1.10 Water Bore Rehabilitation

Water bores will remain in place during the rehabilitation works to support groundwater monitoring, only being rehabilitated once major works are completed. Closure and rehabilitation will involve grouting and removal / cutting off of the casing, and capping to ground level. Any disturbed area around the bore will be revegetated, although given their location this will be minimal.

6.2 Tailings Storage Facilities

No tailings of any kind have ever been generated at this mine site.

6.3 Voids

6.3.1 Brolga

Three residual voids are in the closure design for ML5866: Pit 1, Pit 2 Extension and Pit 8.

All open pits currently have ramps, which will be preserved in the proposed final landform. All open pits are in the closure design as dams for the post-mining land use, grazing (Figure 6-7). The disturbance feature 'Pit 8' (RA12) is topographically the lowest final void in the closure design.

The dimensions of the voids are given in Table 6-5 and Table 6-6.

Table 6-5. Residual void dimensions

Final Void	Depth	Length	Width
Pit 1	22	204	192
Pit 2 Extension	36	226	194
Pit 8	25	270	225

Table 6-6. Residual void maximum slope angles

Final Void	High Wall	Low Wall	End Walls
Pit 1	33°	27°	34°
Pit 2 Extension	40°	40°	40°
Pit 8	40°	20°	30°

Advice regarding the long-term stability of each of the three final voids was sought from a geotechnical specialist. The consequent recommendations are discussed in Appendix 11.

The final void that requires major modification to the pit walls is Pit 1 (RA11). Pit 1 currently has instability in its walls. The wall design is as a series of berms and batters. The lateritic layers contain a greater proportion of smectite clay in this pit, which swells upon wetting, resulting in instability. There is a noticeable accumulation of wasted regolith along the berms of Pit 1.

It was recommended that the walls of Pit 1 be flattened to a slope of 1.5 horizontal to 1.0 vertical for long term stability. This has been included in the proposed rehabilitation works for Pit 1. The western and northern walls have already been graded back and have a large amount of back-fill at their bases to ensure their stability.

In the final landform, Pit 1 will receive run-off from the catchment shown in Figure 6-5. The catchment includes only the Go Line Pad and some of the Top Pad and adjacent haul road. Run-off from the Go Line Pad will pass through a culvert that is to be installed. The water management system – comprised of diversion bunds, dams and other drainage systems has been designed to keep water on site. Water quality would be consistent with that in the surrounding farm dams (including Dams 1, 2 and 3) which meet the water quality targets.

The other final voids (Pit 8 and Pit 2 Extension) have strong rock throughout their walls. Geotechnical advice recommended no changes to the geometry of these existing walls. All three final voids require safety bunds to be installed at the top of the steep slopes.

All areas with potentially unsafe slopes and drops will be fenced off with appropriate signage installed to exclude both cattle and humans from accessing these areas.

6.3.2 Canoona

As a result of the exploration activities described in Section 2.2.3.3, two very minor voids exist on Canoona (the EP Act defines a void as 'an area of land…excavated in the carrying out of a mining activity'). These are shallow (less than 2 m deep), less than 100 m^2 and roughly rectangular in shape. The side walls have slumped and the ends are gently sloping, allowing easy access and egress. They do not pose any environmental or safety risk. Vegetation is regrowing naturally in and around them, and any efforts to rehabilitate them would result in greater environmental damage than any benefit given the amount of vegetation clearing that would be required to access them and undertake earthworks.

6.3.3 Voids in Floodplains

6.3.3.1 Brolga

The entire area of ML5866 Brolga is mapped within the Fitzroy River, Fitzroy sub-basin Floodplain Assessment Overlay.

The land encircling ML5866 is at elevations of around 20 metres, gradually sloping towards Alligator Creek five kilometres to the east. It is geologically mapped as Quaternary Holocence Alluvium. The Palaeozoic Serpentinite rises above the floodplain.

The majority of ML5866 is topographically higher than the surrounding land, on a distinctive rise above the Quaternary floodplain. Most of ML5866 is above elevation 20 metres, to a maximum elevation of about 70 metres above sea level.

Three residual voids are in the closure design for ML5866: Pit 1, Pit 2 Extension and Pit 8. They are above the geological floodplain as demarcated by the Quaternary sediment that surrounds the Brolga mine. All are in the closure design as dams for the post-mining land use, grazing. The disturbance feature 'Pit 8' (RA12) is topographically the lowest final void in the closure design.

Flood modelling was not carried out. 'FloodCheckMap' was used to qualify the risk of inundation on final voids in ML5866 (refer to Section 2.3.5.2). The 1% AEP and extreme flood extents near the EA are shown in Figure 2-15 and Figure 2-16 of the Baseline Information section of this report.

Peak water level at a flood event of 1% AEP shows that floodwater would intrude ML5866 near its perimeter, but not enter any final void. Peak water level at 'extreme event' indicates that floodwater would enter a final void, Pit 8. As a result, an examination was undertaken to examine whether Pit 8 will be stable enough to endure extreme event flooding.

Inspection of Pit 8 by geologists and an independent geotechnical specialist determined that the rocks of the pit walls within Pit 8 are exceptionally strong, not reactive to moisture and not susceptible to erosion. The rocks are very high in silica content, non-friable and have very low permeability and low porosity. During an extreme flood event, it is probable that Pit 8 would already be full, and mitigate flow energy that may result from regional flooding. These observations concluded that Pit 8 will remain stable during a 0.1% AEP extreme flood event, and not intensify any scouring, erosion or sedimentation.

Water contained in Pit 8 will be suitable to support the intended post mining land use of grazing. As such, should any flooding of Pit 8 occur in an extreme event, it would not be expected to cause any impacts to downstream environments (see Section 2.3.5.4 and Appendix 4).

6.3.3.2 Canoona

There are no voids in the floodplain at the Canoona ML. The majority of ML5864 sits above the floodplain, however a small part of Canoona is mapped within the Floodplain Assessment Area. None of the areas that were formerly explored lie within the 1% AEP flood extent. Two former drillpads/boreholes (number 4 and 9) lie at the very edge of the Peak water level at 'extreme event' flood level.

Given there are no voids in floodplains, and the fact that Canoona will not be significantly disturbed during rehabilitation activities (only weed and fire management are required), it is therefore considered that there would not be any risk to any environmental value on, or in proximity to the Canoona ML as a result of flooding.

6.4 Dams

Pit 1 (RA11), Pit 2 Extension (RA4) and Pit 8 (RA12) are all final voids that will be modified to become dams. (Pit 1) currently contains water more or less permanently, and the other voids are expected to contain water for shorter periods during the wet season. Dam 4 is located on the eastern boundary of ML5866.

This water infrastructure will allow the water captured on the site to be utilised for pasture irrigation and cattle watering, consistent with the PLMU. As demonstrated in Section 2.3.5.4, the quality of the water in these impoundments will be suitable for stock watering and irrigation.

Management and maintenance of the pits is described in Section 6.3. Regarding water dams, in general management and maintenance will include the following activities:

- Initial assessment of sediment contamination within water impoundments
- Geotechnical assessment and stability works for banks and walls
- Revegetation (where necessary) of banks and adjoining areas
- Water quality monitoring, to identify issues within the dam or catchment, and collect sufficient data to confirm the quality meets the water quality targets
- Ongoing visual inspections for stability and water quality (e.g. surface slicks and scums, algal blooms).

6.5 Underground mining

No underground mining of any kind has ever been undertaken at this mine site.

6.6 Built Infrastructure

The mine has been in Care and Maintenance since 2016 and all mine equipment has been removed from the site.

Specifically, the only remaining infrastructure on site is as listed below:

- The network of haul roads
- The network of access tracks
- The bath-house infrastructure.

These will remain as post-mine infrastructure in support of the PMLU. A further description of each of these features is given below and their location is depicted on Figure 6-7.

The landholders, QNI Resources Pty Ltd and QNI Metals Pty Ltd, have provided a statement that they will accept responsibility for the infrastructure once mining has ceased (see Appendix 8).

The aforementioned infrastructure will be retained as it is consistent with, and will support, the PMLU of low-intensity grazing. In addition, one culvert will be installed to drain water from the Go Line to Pit 1. The toilets and showers within the bath-house will be useful for future workers on the property. The roads will allow for access around the site for management of weeds, fire and cattle.

6.6.1 Haul Road

The Haul Road (RA19) network contains 2.82 kilometres of compacted tracks. They are unsealed formed roads built using overburden from the upper red-brown lateritic layer, an ideal road-base material. The haul road network will be utilised throughout rehabilitation works, and will be maintained to support these works, with final reshaping, drainage and surfacing works conducted prior to completion of rehabilitation where needed. General maintenance works will include:

- Maintenance of road geometry and drainage systems, through reworking and recompaction where required
- Installation, inspection and maintenance of the culvert and other drainage structures (e.g. erosion, damage / cracking of structures, etc.)
- Grading where corrugation, rutting, and/or potholes form
- Dust suppression (i.e. water carts) to control dust emissions where required from traffic.

6.6.2 Access Tracks

The network of access tracks includes 5.7 kilometres (total length) of pushed track. Management and maintenance will be similar to, but of a much lower magnitude, to the haul road, with works including vegetation management and trimming and general track management.

6.6.3 Bath-house

The bath-house includes two adjacent demountable structures (shower and toilet block) with a septic tank, rainwater tank, underground PVC pipe to the rainwater tank, and some concrete paths and pads, all contained in a clearing approximately 1,700 square metres in area. Ongoing maintenance of these structures will include:

- Inspections for general wear and tear, and the need for repairs to maintain quality (e.g. cracks in walls, paths, maintaining working order for doors, windows, etc.)
- Plumbing and electrical inspection, and replacement / refitting where required
- Pump out of septic tank (once at the start of rehabilitation, and generally 5 yearly thereafter depending on use).

6.6.4 Culvert

The culvert is yet to be installed. It will drain water across the Haul Road (RA19) from the Go Line area to Pit 1. It is required to prevent erosion of the Haul Road from water run-off.

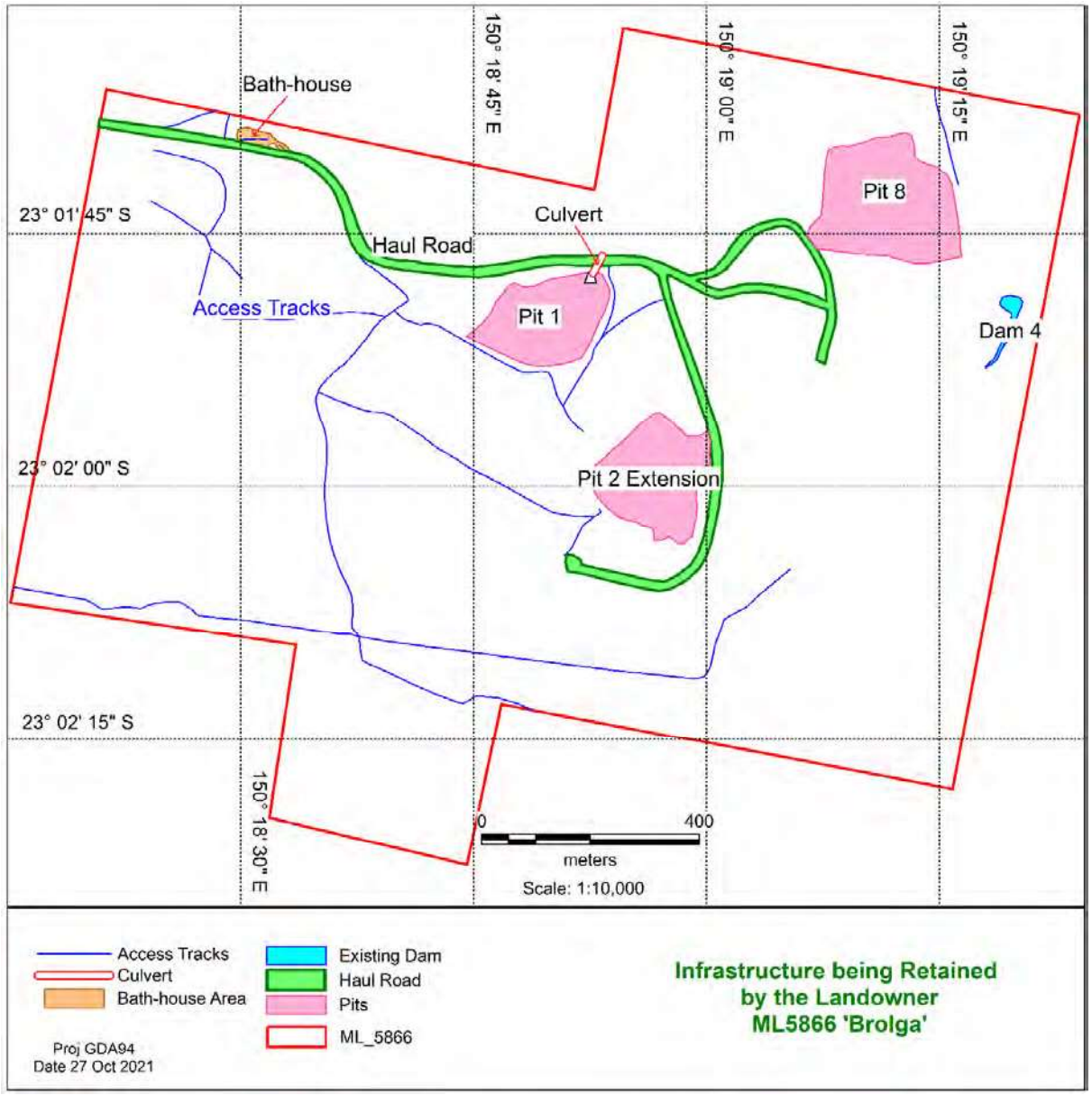


Figure 6-7. Infrastructure being Retained by the Landowner

6.7 Final Site Design

Figure 6-8 and Figure 6-9 show the final site design for both MLs, including:

- the maximum disturbance footprint
- resource tenure boundaries
- PMLU for the land within the MLs
- flood plain extent.

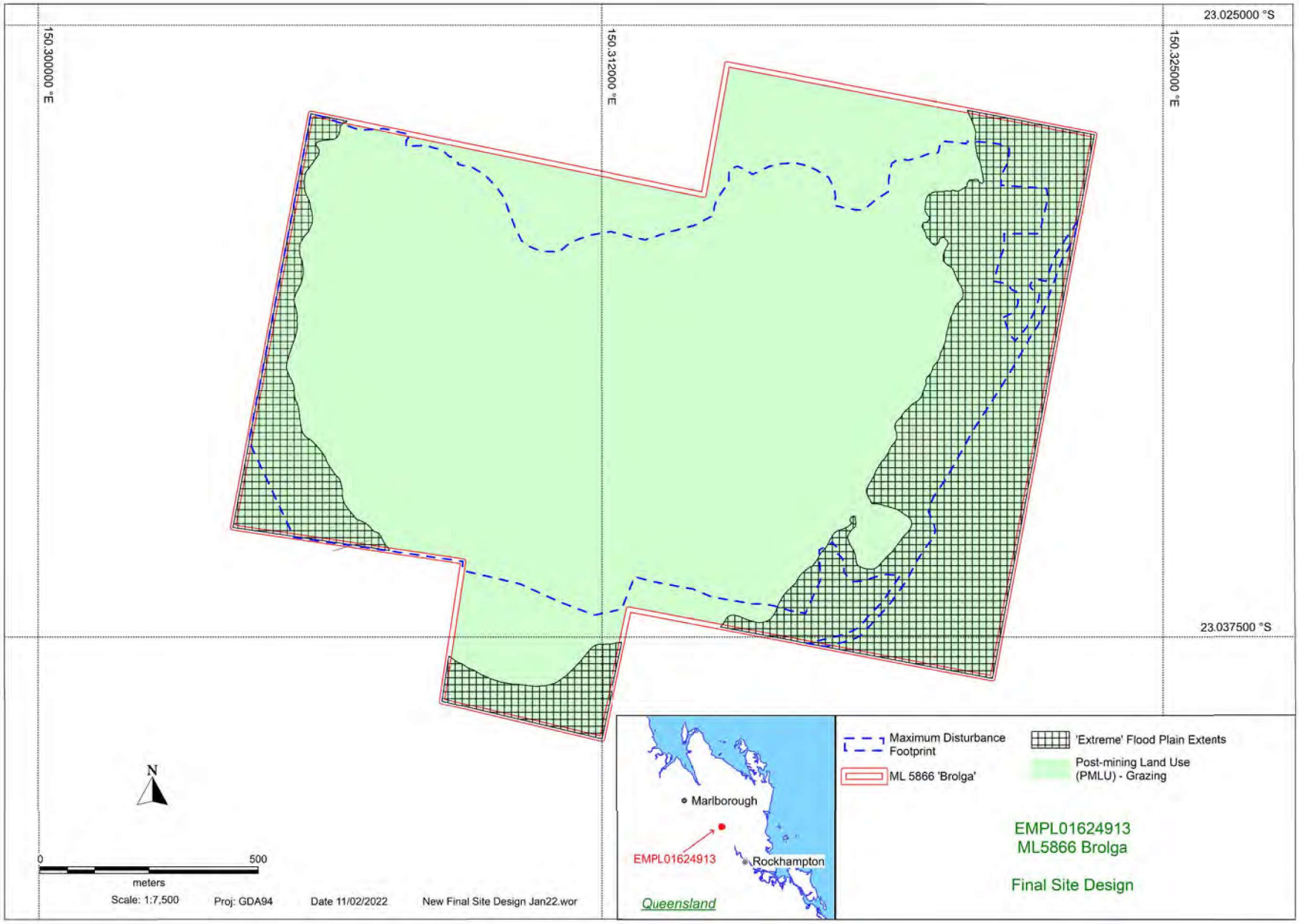


Figure 6-8. Brolga ML final site design

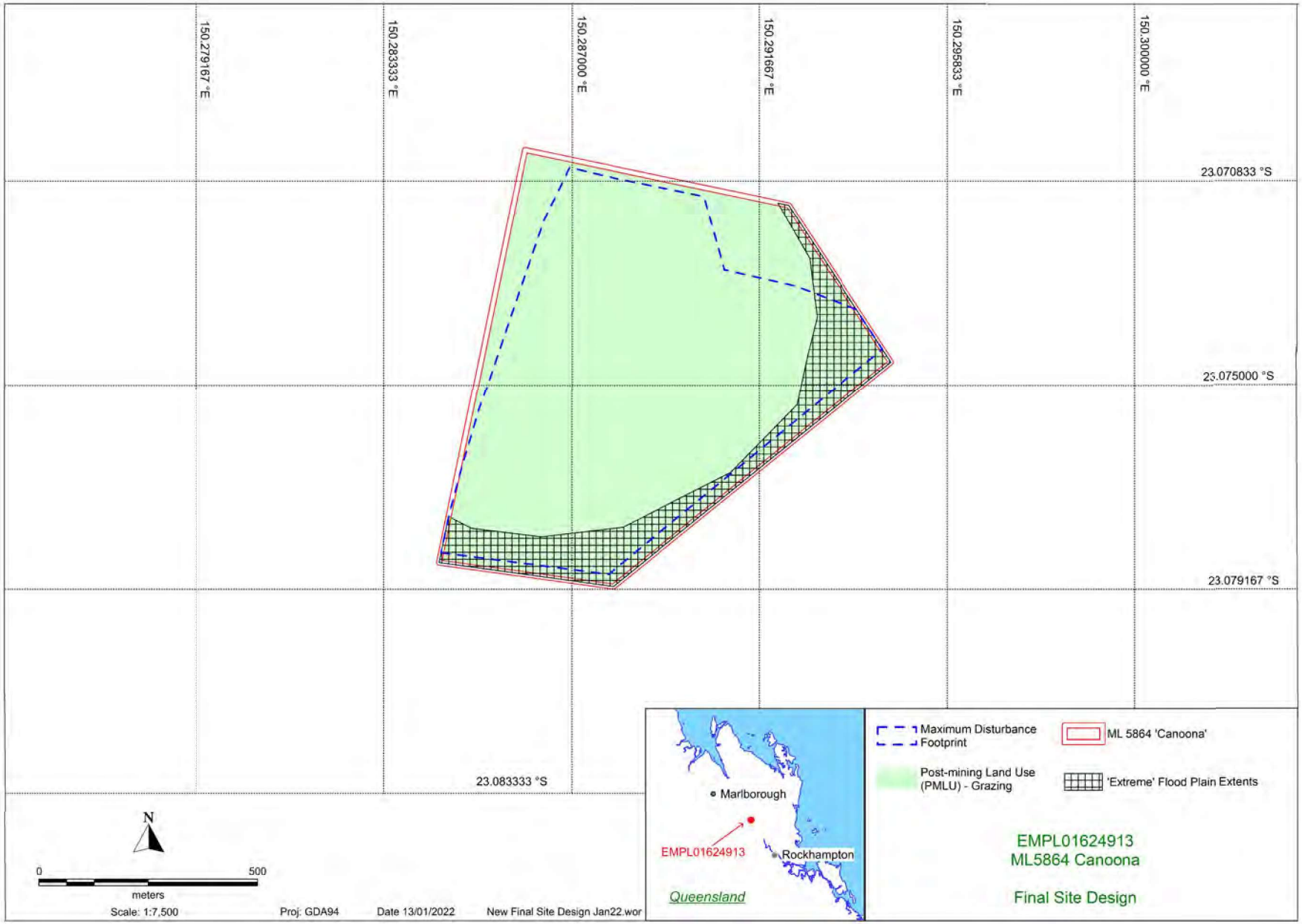


Figure 6-9. Canoona ML final site design

6.8 Management System

Management of rehabilitation works will be undertaken within a health, safety, environment and quality management system (HSEQ System), based on a continuous improvement and risk-based model already in place at QNI. The key elements supporting this PRCP include:

Incorporating the PRCP Requirements into the HSEQ System

The existing QNI HSEQ System will refer to and report on progress with the PRCP as one of its fundamental components, and adopt objectives and targets relevant to safe completion of the PRCP.

Non-Conformance and Corrective Action

Any rectification or requirements for further action identified in any monitoring or assessment program (or opportunistic observation) will be added to the existing QNI incident register recording at least the following details:

- Area located, including link to spatial database location, by whom and date of observation / finding
- Description of the issue
- Detail of the rectification or follow up actions required
- Responsible party for action
- Required timing for completion
- Where relevant, evidence required for completion (refer to milestone monitoring, Section 8.1.9 where relevant).

Roles, Responsibilities and Training

The QNI HSEQ System will be used to include specification of roles and responsibilities, and an assessment of training needs, along with tracking of training conducted.

Communication, Supplier and Sub-contractor Management

The QNI HSEQ System will also further address communication needs and requirements at Brolga and Canoona, including both internal and external communications, and the management of suppliers and subcontractors.

Documentation and Records

The existing QNI system will be used to manage and maintain documents, ensure quality control (e.g. the latest documents are in use), and to retain appropriate records.

7 Risk Assessment

Section 3.7 of the Guideline – Progressive Rehabilitation and Closure Plans - specifies that a PRCP must include a risk assessment, one which identifies "the risks of a stable condition not being achieved and how the applicant intends to manage or minimise the identified risks." This section of the proposed PRCP contains the results of the risk assessments that were carried out during the PRC planning process.

The risk assessment process demonstrated to the applicant that, although a variety of risks will be encountered during and after remediation works, many of the identified risks are common across multiple features in the disturbed area. Therefore, the identified risks and proposed mitigation measures are generally the same across the entire area.

The analyses include a tabulation of the identified risks and proposed controls common across multiple features in the disturbed area (Table 7-2) and the controls that mitigate them.

Below are some relevant facts:

1. The mine has not operated since early 2017, and in that time no mass failure of pit walls or out-of-pit spoil structures has occurred
2. The disturbed area includes multiple pits, some back-filled partially or wholly, and some out-of-pit dumps that are maintained as either waste rock dumps or out-of-pit dumps modified for use in mine operations (stockpiling, parking)
3. Previous rehabilitation of completely barren areas, back-filled pits and spoil dumps within ML5866 was successful (Section 2.7.1)
4. There is a large topsoil reserve retained within ML5866
5. There are large areas within and near ML5866 available for seed collection
6. There has never been any chemical treatment of ore on site
7. The only beneficiation of ore on site has been screening
8. There are no acid generating minerals exposed by the mining operation
9. The local climate has distinctive wet and dry seasons.

The main risk groups that were identified were: failure of slopes; poor vegetation regrowth; unsuitability of revegetation; over-topping of dams; erosion/scouring and sedimentation of drainage paths.

To control these risks, the following measures were introduced to the rehabilitation planning and design process:

- Geotechnical consultant to design residual void and out-of-pit dump slopes
- Minimise catchment areas for all dams
- Drainage paths for potentially overtopping dams to be controlled by berms and areas already revegetated
- Nontronite stockpile to be pushed down
- Revegetation trial to be conducted early in the rehabilitation plan, on a small area (Test-Pits) (see Section 7.1 below)
- Back-filling to maintain gentle slopes with terraced landforms
- Plant species known to grow locally, pasture and forest types

- Conduct earthworks during dry season
- Conduct seeding during spring
- Install bunds to control drainage paths and diminish flow speed
- Install fences where necessary to control livestock movement.

Both inherent risks (risks without control) and residual risks (risks with control) are identified and assessed for each hazard. Risks are scored based on definitions in Table 7-1.

Table 7-1. Scoring system used to assess risks

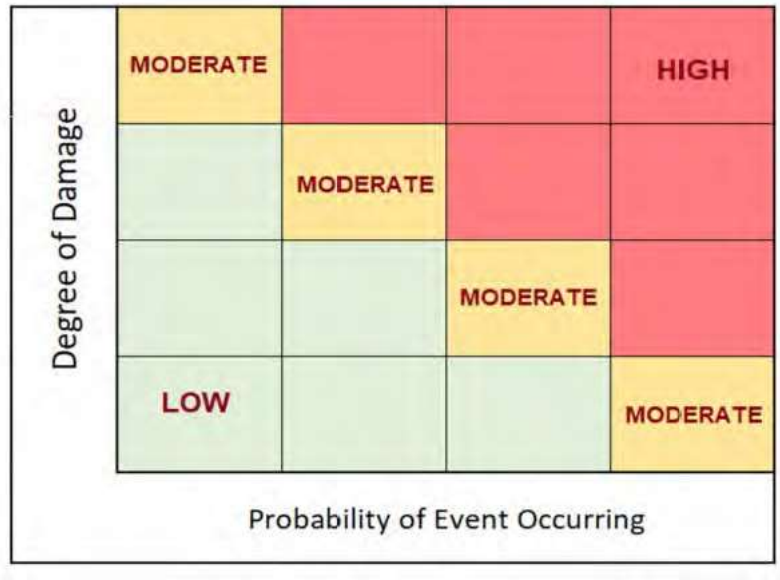
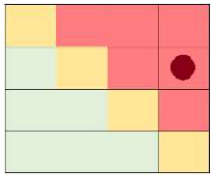
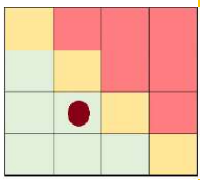
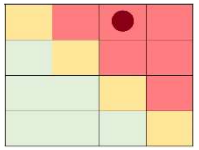
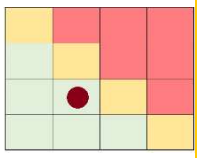
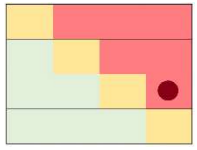
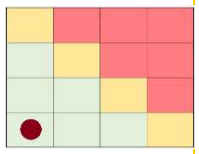
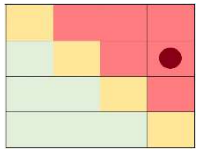
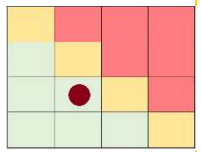
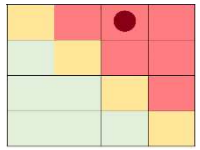
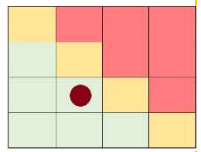
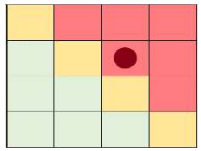
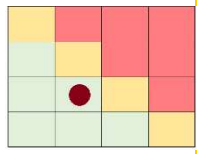
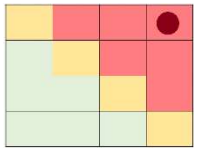
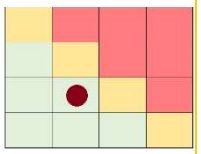
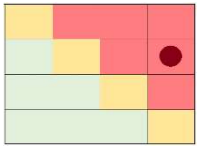
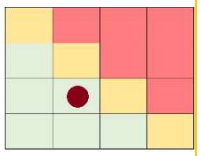
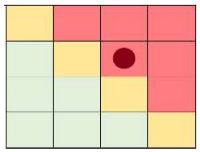
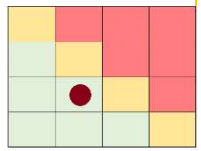
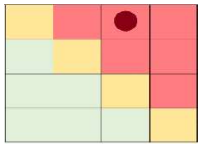
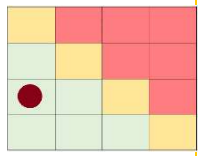
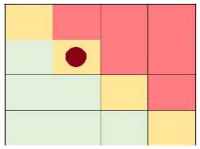
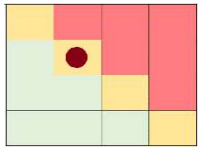
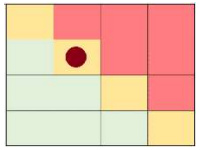
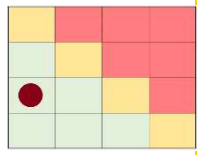
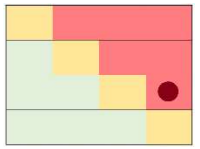
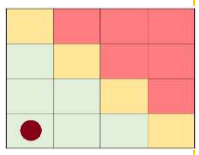
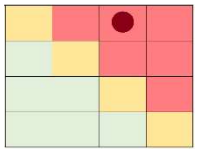
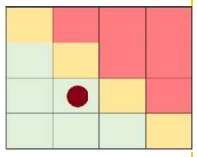
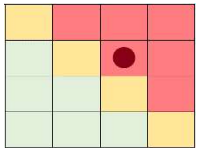
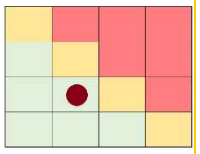


Table 7-2. Risk Assessment Summary

Identified Risk	Potential Consequences	Relevant Disturbance Feature Types	Features Affected by this Risk	Controls (1)	Controls (2)	Controls (3)	Risk without Controls	Risk with Controls
Walls of residual voids unstable	Possible mass-wasting and/or gradual attrition of wall rock, causing additional wall instability, erosion and downstream sedimentation	All voids and all pit walls that have not been fully back-filled	Pit 1, Pit 2 Extension, Pit 3, Pit 8	Use of a geotechnical consultant to assess stability and recommend mitigation measures	Minimise catchment area to reduce infiltration of water. Direct water run-off away from walls	Bench back walls and reduce pit wall angles where necessary		
Over-topping of residual voids	Overland flow causing loss of vegetation, erosion of soil and downstream sedimentation	Residual voids	Pit 1, Pit 2 Extension and Pit 8	Ensure catchment areas are small	Reform landform to direct possible outflows across low-risk areas	Ensure voids/dams are large but shallow. Evaporation rate is 700 mm / year in this region		
Final Landform of non-residual pit walls unstable	Possible mass-wasting and/or gradual attrition of wall rock, causing additional wall instability, erosion and downstream sedimentation	All pits that are not fully back-filled	Pit 4, Pit 5, Pit 5 South	Fully back-fill all these to landform of surrounding area	Conduct earthworks during dry season, Winter and Spring months	Conduct topsoiling and seeding promptly after earthworks		
Instability of Spoil Pile Walls, Pad walls, Overburden Dumps	Mass failure creating an unstable landform, resulting in severe sedimentation downstream	Waste rock dumps and other spoil piles and pads	Pit 2 backfill, Pit 3 backfill, Waste Rock Dump 1 (WRD1), Go Line Pad, Top Pad	Use of a geotechnical consultant to assess stability and recommend mitigation measures	Minimise catchment area to reduce infiltration of water. Direct water run-off away from walls	Bench back and reduce spoil pile edge angles where necessary		

Identified Risk	Potential Consequences	Relevant Disturbance Feature Types	Features Affected by this Risk	Controls (1)	Controls (2)	Controls (3)	Risk without Controls	Risk with Controls
Instability of Stockpiles	Possible mass-wasting and/or gradual attrition of stockpile, causing additional wall instability, erosion and downstream sedimentation	Any stockpile	Nontronite Stockpile, ROM Stockpile, Low-grade Stockpile and Unscreened Low-grade Stockpile	Use these stockpiles for back-filling operations	Push down any remaining stockpile	Use any remaining stockpiles to make a final landform that drains away from sensitive areas		
Erosion / scouring due to high slope angles	Possible sedimentation of downstream waterways	Slopes of pit walls, spoil piles, back-filled pits	Pit 1, Pit 2 Extension, Pit 8, Waste Rock Dump (WRD1), Go Line Pad	Use of a geotechnical consultant to assess stability and recommend mitigation measures	Minimise catchment areas and manage run-off in/near high slope domains	Prompt top-soiling and revegetation after earthworks using mainly local *Acacia* species		
Erosion / scouring of any surface	Possible sedimentation and scouring of downstream waterways	All Disturbance Features		Revegetate using local species (especially fast growing *Acacia* spp.) and other species known to grow well in the area.	Redirect run-off using appropriate landform design	Minimise catchment areas where risk is considered to be high		
Instability of slopes, spoil piles and pit walls	Possible sedimentation of downstream waterways,	Slopes of pit walls, spoil piles, back-filled pits	Pit 1, Pit 2 Extension, Pit 8, Waste Rock Dump (WRD1), Go Line Pad, Nontronite Stockpile	Schedule earthworks during Winter and Spring months, when disturbance features are low in moisture content	Use of a geotechnical consultant to assess stability and recommend mitigation measures			

Identified Risk	Potential Consequences	Relevant Disturbance Feature Types	Features Affected by this Risk	Controls (1)	Controls (2)	Controls (3)	Risk without Controls	Risk with Controls
Erosion / scouring during rehabilitation operations	Loss of topsoil stock; mass wall failure; possibility of severe downstream sedimentation;	All Disturbance Features		Conduct earthworks during Dry season, Winter and Spring months	Conduct topsoiling and seeding soon after earthworks	Utilise appropriate erosion and sediment controls		
Loss of recently top-soiled and seeded areas due to torrential rain	Loss of topsoil stock; possible downstream sedimentation; necessity to re-schedule rehabilitation works	All Disturbance Features		Schedule top-soiling and revegetation in late Spring, before heavy rain but when soil moisture is moderate	Conduct earthworks during Dry season	Monitor predicted La Nina events to anticipate ideal timing of top-soiling and seeding		
Water quality in dams to be retained does not meet water quality targets	Water cannot be used to support the PMLU	Dams / residual voids	Pit 1, Pit 2 Extension, Pit 8, Dam 4	Assess and if necessary remediate sediment within water storages	Rehabilitate receiving catchments	Monitor water quality, and remediate pollutant sources		
Groundwater quality indicates decline in water quality	Potential impacts off-site	Likely features associated with residual voids, chemical/fuel storage areas, water bores		Continue to monitor water quality to provide early warning of potential issues	Based on the monitoring, assess site for potential sources causing the change			
Final Landform suitability for cattle grazing	Loss of land value; Loss of potential land use	All Disturbance Features		Final landform design to have low gradient wherever reasonably possible.	Back-filling to a terraced landform	Retention of some voids for water storage		

Identified Risk	Potential Consequences	Relevant Disturbance Feature Types	Features Affected by this Risk	Controls (1)	Controls (2)	Controls (3)	Risk without Controls	Risk with Controls
Revegetation suitability for cattle grazing	Risk that the rehabilitation does not suit the post-mining land use	All Disturbance Features		Revegetation species to include known pasture grasses suitable for the climate (green panic, silk sorghum, rhodes grass) with some forest species (local *Acacia* species + *Eucalyptus fibrosa*) and *Corymbia xanthope*	Retention of access roads and voids that are suitable for dams	Weed control [Giant Rats Tail grass - *Sporobolus pyramidali* and Lantana – *Lantana camara*		
Revegetation self-sustaining	Denudation of vegetation resulting in erosion and loss of post-mining land use suitability	All Disturbance Features		The grass species are proven sustainable pasture grasses suitable for the area. Forest species will be local only.	After establishment of vegetation, bird life is likely to facilitate introduction of other local species			
Revegetation regrowth rate poor	Erosion of soil, scouring and sedimentation of downstream drainage	All Disturbance Features		Conduct regrowth trial on small area (Test Pits) first	Use local species, known to grow nearby	Sow seed in spring		

7.1 Rehabilitation Trial (Test Pits - RA1)

A Rehabilitation Trial is planned on the 'Test Pits (RA1)' as a risk control measure. The Test Pits comprise five discrete bulk sampling pits and their associated overburden waste rock. The combined area of these five bulk-sampling pits is 0.45 hectares. The purpose of the trial is to evaluate, and modify if required, the proposed rehabilitation methodology associated with final landform design. The trial is planned to commence in April 2024 and conclude in April 2030.

As per the Progressive Rehabilitation and Closure Plans Guideline, rehabilitation trials will not result in the delay of rehabilitation and will take place in locations that have already been disturbed as part of earlier mining operations.

The Rehabilitation Trial commences in winter 2024. Seeding will take place in spring, 2024. This allows for at least a year of establishment prior to the earliest scheduled revegetation of the (RAs) (RA2 – RA7) and more than two years before the remaining areas. The success of this revegetation exercise will determine whether the back-filling, topsoiling and revegetation methods are appropriate. Amendments will be made to the PRCP planning part as required to reflect changes to revegetation species, timing or techniques. Milestones will also be reviewed and amended accordingly. This will provide confidence for the larger areas scheduled for rehabilitation afterwards. Any seed-bank that may still exist in the topsoil will also be assessed during the Rehabilitation Trial.

It should be noted that there is a high degree of confidence that the proposed rehabilitation measures will be successful, based upon the prior successful rehabilitation of the Brolga site under a previous mining tenure by a previous tenement holder.

7.1.1 RA1 - Milestones

As the PRCP is an adaptive document, any required modifications to rehabilitation activities elucidated during the trial will be used to improve on the final design.

The Rehabilitation Activities for the Test Pits begins in the dry season. The Rehabilitation Milestones (RMs) for the trial are the same as those listed for all the other Rehabilitation Activities (Section 4.5). The Rehabilitation Milestones for the trials on the Test Pits are as follows.

After a contaminated land assessment (RM1) the Test Pits will be back-filled using the overburden stockpiles that are adjacent to each pit (RM2). Additional fill can be taken from the nearby Waste Rock Dump. Topsoiling assessments to determine the fertility, and suitability, of the topsoil for the PMLU will be undertaken prior to spreading. After checking the stability of the earthworks (RM2), any amelioration required will be undertaken and then topsoiling will follow after back-filling (RM3).

Topsoil can be taken from the Topsoil Dump 1 (near the Waste Rock Dump) or Topsoil Dump 6. All earthworks and topsoiling will take place following checks on erosion and stability of the land surface.

Seeding is to be carried out in the spring months following the back-filling and surface preparation works. Germination success and landform stability can be checked during and after the wet season. Monitoring of the area continues until a sustainable post-mining land use is achieved (RM6). However, monitoring will continue annually until the end of full site rehabilitation, to identify any issues that may arise over the long term. Adjustments to optimise methods and timing of seeding can be made if success rates are lower than expected, and reassessed after each wet season.

As the PRCP is an adaptive document, any required modifications to rehabilitation activities elucidated during the trial will be used to improve on the final design.

8 Monitoring and Maintenance

This section describes the monitoring and maintenance practices to be undertaken to ensure and demonstrate that the milestones and milestone criteria have been achieved.

A Monitoring and Maintenance Program will be implemented by QNI to monitor the rehabilitation activities and outcomes. The overarching objective of the monitoring program is to evaluate the progress of the rehabilitation activities. Regular maintenance and monitoring will allow for the identification of any discrepancies between the planned objectives and targets and the actual rehabilitation, and, if required, for corrective actions to be implemented in a timely manner. The monitoring program will:

- compare monitoring results against the planned rehabilitation objectives and targets
- assess and monitor stability of landscape in accordance with reference milestones
- assess effectiveness of environmental controls implemented
- where necessary, identify modifications required for the monitoring program and/or rehabilitation practices
- compare flora species present against original seed mix
- assess vegetation health.

The main activities within the monitoring will be to check that the actual rehabilitation accords with the planned design; check for erosive scouring and other degradation; quantify the success of revegetation (when it is carried out); monitor water quality and conduct and weed surveys. Regular checks are already made for weed species, and this will continue under the PRCP monitoring program. Monitoring will be particularly frequent after seeding. Most monitoring for erosion will be carried out during the summer wet seasons, when the site is the most susceptible to instability.

8.1 General Monitoring and Maintenance Practices

8.1.1 Visual Inspections

Visual inspections will be required of various elements of the rehabilitation works. The general requirements for these visual inspections are as follows:

- All inspections required under the monitoring program are to be documented and maintained in an electronic format available to site and company management, and authorised officers on request
- The documentation must include notes and photographs confirming the findings and outcomes of the inspection
- Any shortfalls or rectification works required must include:
  - Required actions
  - Responsible person to ensure the actions are completed
  - Timing for completion of the action.

As part of confirming the removal of all equipment and infrastructure not being retained for post-mine use and in addition to the above, a decommissioning checklist will be completed. This will include confirmation that all services, pipelines, buildings, equipment and other ancillary infrastructure has been removed or is absent from the area investigated, and that all rubbish has

been removed. For infrastructure to remain, this will be detailed on the decommissioning checklist (location, condition, ongoing maintenance and general management requirements).

In general, weekly visual inspections are to be conducted during on site works for Milestones RM1 to RM3 and RM4. Additional opportunistic inspections should be undertaken, with any observations written in the site manager's logbook.

8.1.2 Surface Water Monitoring Program

A surface water monitoring program is currently being undertaken on the site, including Pit 1 and Dam 4, plus the Dams 1 – 3 which sit on the Brolga property, but outside of the mining lease boundary. This program is to be continued to support ongoing assessment of water quality and site suitability, with the data used to inform achievement of impoundment water quality targets in Milestone RM6. As such, monitoring will:

- Be conducted Quarterly, following the initial assessment in Milestone RM1 of impoundment sediment and water quality
- Continue until Milestone RM6:
  - Should water quality meet the water quality targets, this may be reduced to six-monthly until Milestone RM6 is completed. Cease monitoring thereafter.
  - Should the water quality not meet the water quality targets, continue quarterly monitoring until the targets are reached, and continue quarterly monitoring until Milestone RM6 is completed. Cease monitoring thereafter.

Monitoring locations are a site for each impoundment representative of the water quality within the following impoundments (refer Figure 2-12):

- Pit 1
- Pit 2 extension
- Pit 8
- Dam 4.

Water quality monitoring will also be undertaken within Dams 1, 2 and 3, which receive runoff from the site, and which will also act as reference sites for quality particularly within the Pits and Dam 4.

The EA for the site requires compliance with surface water quality targets, related to livestock watering criteria from Volume 3 of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000). As such, the EA targets for surface water impoundments are adopted as the final water quality targets.

Monitoring will include the parameters in Table 8-1. The relevant impoundment water quality targets for Milestone RM6 are also shown in Table 8-1.

Table 8-1. Surface water monitoring water quality targets

Parameter	Units	Water Quality Target	Source
pH	pH units	6.0 – 9.0	1
Electrical Conductivity (EC)	µS/cm	5970	1
Total Dissolved Solids	mg/L	Monitoring only	3
Major cations, alkalinity	mg/L	Monitoring only	3
Sulfate as SO_4	mg/L	1000	1
Chloride	mg/L	Monitoring only	3

Parameter	Units	Water Quality Target	Source
Fluoride	mg/L	2	1
Total Arsenic	mg/L	0.5	1
Total Cadmium	mg/L	0.01	1
Total Chromium	mg/L	1	2
Total Cobalt	mg/L	1	1
Total Nickel	mg/L	1	1

Table notes:
1 Environmental Authority EPML01624913, Table F2
2 Contaminant limit based on ANZECC & ARMCANZ (2000) stock water quality guidelines
3 Added as supporting information

8.1.3 Groundwater Monitoring

Monitoring of depth to standing water level and quality in groundwater wells will be undertaken on a six-monthly basis throughout the rehabilitation program, until completion in the final Milestone. Monitoring will be conducted within the bores required to be monitored under the EA for the site, plus the two new bores installed in late 2021 and the bore located off-lease adjacent to Dam 3, namely:

- Bore 1 (existing long term bore, named site BB1 in the EA)
- Bore 2 (existing long term bore, named site BB2 in the EA)
- QNWB4 (new deep well adjacent to Pit 1
- QNWB5 (new shallow well adjacent to Pit 1)
- Bore 3 (existing unregistered bore adjacent to Dam 3.

Note that no water has been identified within bore QNWB5, and this may continue to be the case. However, continued monitoring should still be conducted to test for any temporary water tables in the vicinity, and their interactions with Pit 1.

Monitoring of these wells will include depth to standing water level – as a depth (in metres) from the top of casing, and a reduced level as metres below ground level – and water quality. Water quality parameters are shown in Table 8-2.

Table 8-2. Groundwater monitoring water quality targets

Table 8-3. pH	pH units	Bores BB1, BB2 - no change from baseline[3]	Source
Electrical Conductivity (EC)	µS/cm	No change from baseline[3]	1
Total Dissolved Solids	mg/L	No change from baseline[3]	1
Calcium	mg/L	No change from baseline[3]	1
Magnesium	mg/L	No change from baseline[3]	1
Sodium	mg/L	No change from baseline[3]	1
Bicarbonate Alkalinity (as $CaCO_3$)	mg/L	No change from baseline[3]	1
Other major cations (K), alkalinity (CO_3, OH^-, Total)	mg/L	Monitoring only	2
Sulfate as SO_4	mg/L	No change from baseline[3]	1
Chloride	mg/L	Monitoring only	2
Fluoride	mg/L	Monitoring only	2
Total Arsenic	mg/L	Monitoring only	2

Table 8-3. pH	pH units	Bores BB1, BB2 - no change from baseline[3]	Source
Total Cadmium	mg/L	Monitoring only	2
Total Chromium	mg/L	Monitoring only	2
Total Cobalt	mg/L	Monitoring only	2
Total Nickel	mg/L	Monitoring only	2

Table notes:
1 Environmental Authority EPML01624913, Table E2
2 Added to allow for comparison between surface and groundwaters
3 No change from baseline conditions in the relevant bore

8.1.4 Spatial Database

A spatial database will be maintained for the duration of the rehabilitation works, and for a minimum of 10 years post-rehabilitation. The spatial database shall contain the following information:

- Site features and layout (existing)
- Post-mining final design landform, as digital elevation model (and contours)
- Rehabilitation areas
- Location of surface and groundwater monitoring sites
- Location of any encapsulation areas, areas to be managed or subject to any constraint as identified in the contaminated site assessment in Milestone RM1
- Survey and digital elevation model (and contours) prepared during Milestone RM2, with updated data when these are updated (maintain copies of all prior survey / DEM data)
- Polygons (derived from the above rehabilitation areas) defining different soil application areas, linked to the register of soil attributes and conditioning
- Polygons (derived from the above soil areas) defining different revegetation areas, linked to the register of revegetation practices and application.

8.1.5 Vegetation Monitoring

Groundcover density and species dominance is to be assessed by an AQP using a recognised, and appropriate method. The method should be such that it allows for a confident estimate of percentage ground cover, and the dominance of each species type within each RA (high pasture productivity may not be sustained in the long term if the pasture comprises one or few species). For RAs that include more than one type of vegetation (i.e. pasture, forest, woodland), each vegetation type within the RA should be assessed.

The method recommended is the BioCondition monitoring methodology described by the Queensland Herbarium (Eyre et al, 2015).

8.1.6 Weeds

Weed control and management is an important component of successful rehabilitation as weeds can be a major source of failure of rehabilitation efforts. As such, it is critical that any new weed infestations are prevented and/or controlled at the earliest possible opportunity.

In addition, QNI is obliged under the *Biosecurity Act 2014* (Qld) to prevent the spread of declared weeds. Some non-declared weeds can also severely impair the successful development of

rehabilitation. It is therefore important to identify and prioritise the weed species of concern and set out their management requirements.

Priority will be given to management of weed species that have the highest risk of severely impairing the success of rehabilitation. Priorities should be reviewed annually, and be informed by monitoring.

Weed monitoring will be undertaken by appropriately qualified and experienced persons, comprising representative sample plots in the revegetation areas at a nominal 10 x 50 m area, with weed identification and percent ground cover determined. Regular weed monitoring to allow the early detection and treatment of new weed infestations will be undertaken during stockpile assessments, soil stockpiling works, surface preparation and planting activities, since weed risk is highest during these activities. After planting, weed monitoring will be undertaken on an annual basis until rehabilitation works are completed.

Weed management practices to be undertaken for maintenance are detailed in Section 6.1.9.8.

8.1.7 Dust Monitoring

In general, dust monitoring will be visual, inspecting for the presence of dust plumes moving off-site, particularly towards sensitive receptors (where present). Should potential for environmental harm or nuisance be identified, dust deposition gauges can be utilised to measure the daily average dust deposited (averaged over a month) near to sensitive receptors, in accordance with AS/NZS 3580.10.1 - Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method.

8.1.8 Fire management

Firebreaks on Brolga must be maintained until rehabilitation is complete. Visual inspections of firebreak by an AQP will be conducted on a monthly basis, reduced later in the rehabilitation works as appropriate.

For Canoona visual inspections should be undertaken to ascertain the timing and frequency of burns on a yearly basis.

Firebreak maintenance and fire management practices to be undertaken (for maintenance on Canoona) are detailed in Section 6.1.9.9.

8.1.9 Monitoring of remaining infrastructure

An annual inspection of the bath house, roads/tracks, and culverts will be carried out by an AQP. An infrastructure management plan detailing monitoring, management and maintenance for each item identified on the decommissioning checklist (refer to Section 8.1.1) to remain will be developed. The monitoring will generally comprise a visual inspection of each item, undertaking any specific maintenance required by the infrastructure management plan. Any rectification works identified in each inspection will be entered into the incident/remediation register for follow up action.

8.1.10 Audits and Reporting

Internal Audits

QNI will utilise its existing internal auditing system to assess the progress of rehabilitation on a six-monthly basis prior to site stabilisation (i.e. vegetation establishment), and yearly thereafter until completion of rehabilitation.

The internal audit will:

- assess progress against the milestones and milestone criteria
- determine whether evidence meets the requirements of the PRCP (i.e. is it suitable to support the completion of Milestones)
- identify remediation requirements, including works and resources required and timing,
- be prepared for site and company management.

External Audits

As required by section 285 of the EP Act, all holders of a PRCP schedule must commission a rehabilitation auditor to carry out an audit of the PRCP schedule every three years.

The purpose of the audit is to assess for the audit period:

- The progress towards achieving milestones
- whether the all the conditions imposed on the PRCP schedule have been complied with
- the accuracy of the information that has been provided to the administering authority, and
- whether the PMLU is likely to be achieved, with reference to the rehabilitation that has and will be carried out.

As part of the adaptive management of rehabilitation at the Project, these audit reports will also be used to assess rehabilitation performance and provide an early warning of necessary corrective actions and will be prepared by a person that meets the requirements under the relevant guideline approved by the chief executive.

Progress Reporting

A summary of the progress against the rehabilitation milestones, key activities undertaken, and any issues and remediation required (along with required actions, timing and responsible persons) is to be completed monthly while works are being undertaken on the site. This may be reduced to quarterly prior to and including vegetation establishment where limited active works are being completed on the site, and six-monthly after vegetation is established.

Annual Return

In addition to the annual return requirements that relate to the Brolga EA, in accordance with section 316J(3) of the *Environmental Protection Act 1994*, the EA annual return must also include an evaluation of the effectiveness of the PRCP schedule, including the environmental management carried out under the schedule, for the year to which the annual return relates.

This evaluation must include:

- whether any milestones to be completed under the PRC Plan schedule during the year have been met, and
- whether the conditions imposed on the PRC Plan schedule have been complied with.

Records

All documentation, inspection reports and checklists, etc., are to be retained in electronic form available to site and company management and other relevant personnel, and to authorised officers on request. Hard copy versions of these should be retained (where originally in hard copy format) in a location accessible to site personnel requiring such access (i.e. site management).

8.2 Reference Sites

The Brolga Rehabilitation Management Standard (refer Appendix C) was prepared to satisfy conditions G1 – G9 (Land and Rehabilitation) of the EA (EMPL01624913). This document was the rehabilitation management plan being utilised prior to the enactment of the *Mineral and Energy Resources (Financial Provisioning) Act 2018* which brought about the requirement to submit this PRCP.

The Rehabilitation Management Standard refers to three reference sites to be established – two for grazing lands and one for the Conservation Area. The Conservation Area (shown as the unshaded area on Figure 2-38) was not (i.e. in the Rehabilitation Management Standard document), and is not, proposed to be disturbed by rehabilitation activities, other than weed control and fencing to ensure protection from excessive grazing. As such, it is not a Rehabilitation Area as per the PRCP guidelines and so does not need to be monitored via a Reference Site.

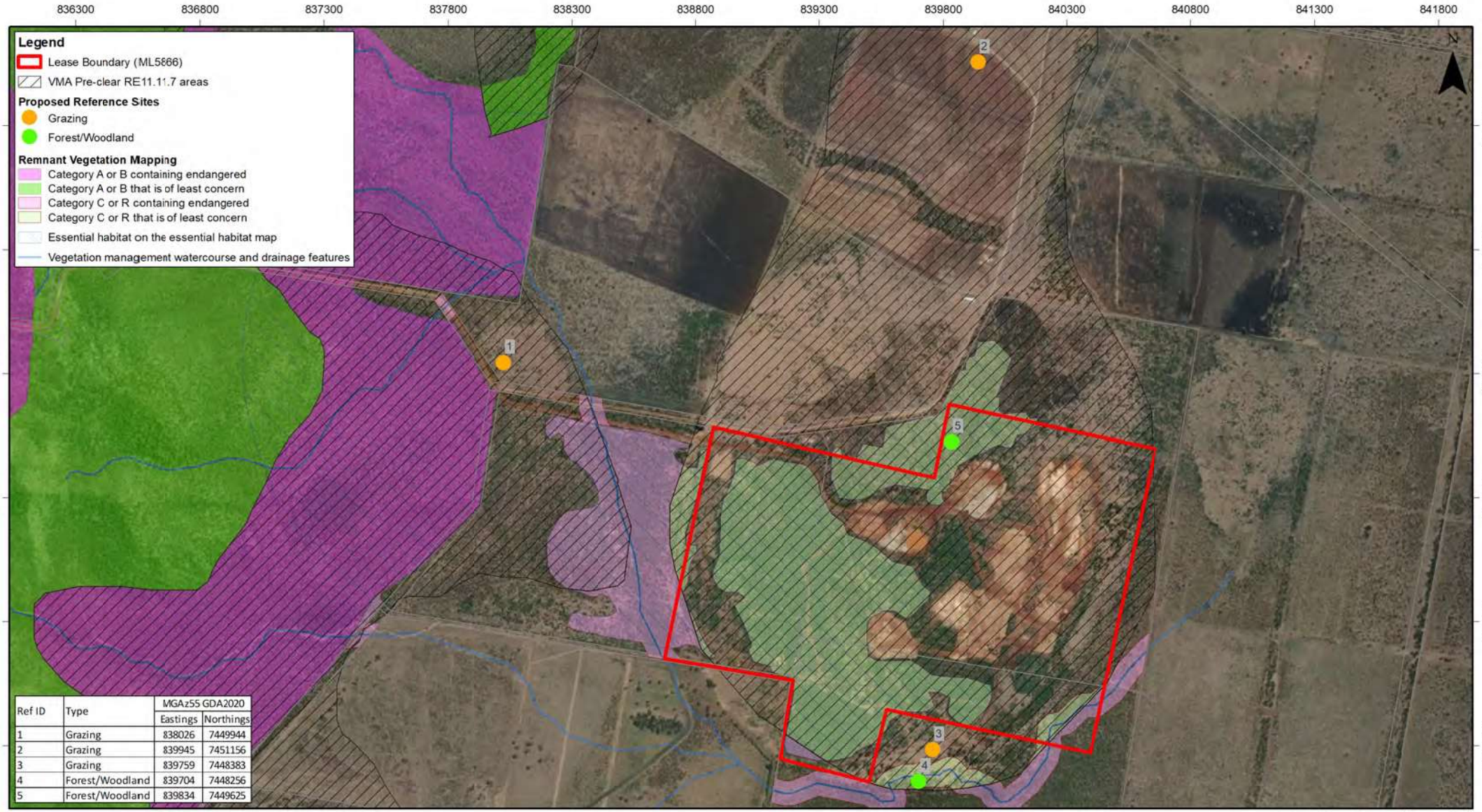
The PMLU for the Brolga ML is low-intensity grazing, consisting of a mix of 'pasture', 'forest' and 'sparse woodland' (see Section 6.1.9). Five reference sites have been identified for the Brolga ML – their location is shown on Figure 8-1, and described in Table 8-4. Sites have been chosen to be representative of 'pasture' and 'forest'. To ensure the reference sites have the same geology, landform and soil as the Brolga ML, the 'pasture' reference sites have been situated on grazing land that is identified as pre-clearing Regional Ecosystem 11.11.7, which is the pre-clearing Regional Ecosystem on the Brolga ML. Similarly, the two 'forest' reference sites are situated on grazing land mapped as regrowth of RE 11.11.7. Within the mix of grazing habitats, 'sparse woodland' is specific only to rocky slopes, like the walls of overburden dumps and some pit walls. These rocky slopes are proposed to be revegetated by sowing Acacia species and any forb that is collectable from nearby forest, into soil cast over scattered areas. As such, within the five reference sites established for 'pasture' and 'forest', the presence, density and diversity of Acacia and forb species will be used as references for the success of the establishment of 'sparse woodland'.

In accordance with the Qld Biocondition Assessment Manual (Eyre et al, 2015) the reference sites have been sized at 100 x 50 m.

It is not proposed to utilise reference sites for the Canoona ML, as it has had no mining activity other than exploration drill holes. Canoona is covered by remnant vegetation (RE 11.11.7 Eucalyptus fibrosa) and requires no rehabilitation activity other than ongoing fire and low level weed management. As such, reference sites are not required for this ML.

Table 8-4. Reference site locations

ID	Description	GCA2020 zone 55	
		Eastings	Northings
R1	Grazing land, west of ML	790487	7458552
R2	Grazing land, north of ML	791779	7457261
R3	Grazing land, immediately south of ML	790852	7458646
R4	Forest/Woodland, regrowth RE11.11.7, adjacent R3	790539	7458924
R5	Forest/Woodland, regrowth RE11.11.7	791315	7458472



Ref ID	Type	MGAz55 GDA2020	
		Eastings	Northings
1	Grazing	838026	7449944
2	Grazing	839945	7451156
3	Grazing	839759	7448383
4	Forest/Woodland	839704	7448256
5	Forest/Woodland	839834	7449625

Figure 8-1. Proposed Reference Sites

8.3 Milestone Monitoring

Eight rehabilitation milestones are set out in section 8.5 (i.e. within the PRCP schedule in Section 8).

Milestones will be used to demonstrate the completion of progressive rehabilitation and improvement steps and events, and will act as completion criteria for the achievement of the PMLU of low-intensity grazing.

A milestone monitoring programme has been developed to set out the methods and techniques to monitor progress towards, and completion of, the rehabilitation milestones. The programme is described below in Table 8-5 with respect to each of their rehabilitation milestones listed. Note that not all milestones are relevant to all rehabilitation areas.

Table 8-5. Milestone monitoring programme

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
RM1 Infrastructure and equipment removed and area available for rehabilitation free from contaminants	All areas	A visual inspection to confirm that all equipment and infrastructure not being retained for post-mine use has been removed.	A visual inspection of the site to be undertaken, with a decommissioning checklist (refer Visual Inspections, Section 8.1) completed. Should any items remain outstanding, identify remediation requirements and complete.	Prior to land disturbance	• Decommissioning checklist
		A contaminated land investigation report is to be prepared by an AQP, to confirm that no contamination is present that is unsuitable for the post-mining land use, or that remediation works have been completed satisfactorily, and the site is suitable for the intended post-mining land-use.	A contaminated land investigation report is to be prepared by an AQP. In order to meet the requirements of the EP Act an AQP must be engaged to: • conduct a site investigation to assess whether contamination exists • prepare a validation report describing any contamination remediation works required, and • if remediation works are not required, or, if required, upon completion of any remediation works, prepare a site suitability statement, stating that land is not contaminated and is suitable for the post-mine land-use of low intensity grazing.		• Reports prepared by an AQP: - Contaminated site investigation report - Validation report (if needed) - Site Suitability Statement
		Sediment within impoundments will be assessed for the potential to negatively affect long term water quality, and validated if necessary post remediation	An assessment of each of the impoundments on the site is to be undertaken to determine the effect of any *in-situ* sediment on long term water quality. An investigation report is to be prepared, based on sampling of sediments and water quality confirming that: • The impoundment is suitable to remain without remediation, or		• Investigation report from AQP • Statement of suitability for each of the impoundments

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
			• Remediation is required, and detailing the remediation and validation testing to be undertaken. In both cases, a statement from an AQP confirming that the impoundment is suitable to support the long term achievement of water quality targets is to be completed.		
RM2 Re-shaping landform complete	RA2, RA3, RA5, RA6, RA8 RA11-18	Visual inspections during the works	Ongoing visual inspections (refer Visual Inspections in Section 8.1) must be undertaken during the works to confirm that: • they are proceeding in accordance with the final design plans • erosion controls are in place, and erosion is suitably controlled during the works • no visible dust moving off-site that could cause environmental harm or nuisance • remediation requirements are identified and actioned as and when required.	Weekly during site works	• Visual inspection sheets, photographs
		Post-completion survey ('as-constructed' plan) and preparation of digital elevation model	Survey of completed area(s) to produce a digital elevation model of the site. This may be completed at different times for different areas, and so surveys must be able to be compiled into a progressive 3D Digital Elevation Model (DEM). The DEM is to be used to produce 'as-constructed' plans, highlighting any discrepancies between the approved designs and actual construction.	At completion of earthworks, but prior to certification	• Digital Elevation Model (DEM) electronic file • 'As-constructed' plans • A database of 'approved design' and 'as-constructed' plans for any engineering works associated with the mine rehabilitation is to be maintained.
		Certification that final landform is 'generally in accordance' with final land design plans	A site inspection and assessment of as constructed documentation and plans is to be undertaken by an appropriately qualified and	At completion of earthworks	• Certification from an appropriately qualified and experienced engineer to

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
			experienced engineer. Certification from this person is required to confirm the final landform is generally in accordance' with final land design plans.		confirm the final landform is generally in accordance' with final land design plans.
		Site inspection and testing, and certification that the site is geotechnically stable	Based on the final design plan and earthworks planning, a geotechnical testing program is required to be developed by an appropriately qualified and experienced geotechnical engineer. During site works, in particular, during significant earthworks, and final shaping and compaction, geotechnical inspections and testing are required to be undertaken to confirm that the works meet the geotechnical and stability requirements of the final design plan. Following completion of works, certification from an appropriately qualified and experienced geotechnical engineer is required confirming the site meets the Milestone requirements for geotechnical stability, including slope angles, all berms, slopes and embankments.	Inspections and testing during earthworks Inspection and final certification at completion of earthworks	• Certification from an appropriately qualified and experienced geotechnical engineer to confirm the landform is geotechnically stable
		Site inspection and certification that the drainage network has been installed and is appropriate to manage stormwater on the site, and that no significant erosion is occurring	Site inspection and certification by an AQP that the final drainage network meets both the final design plan requirements, and that the drainage network is suitably designed and built to convey stormwater without significant erosion, and in a manner that will support long term landform stability.	At completion of drainage works	• Certification from an appropriately qualified and experienced engineer to confirm the drainage network is suitable for the intended post mining landuse
		Site inspection and certification that site slopes are safe.	Following completion of landforming, a site assessment will be conducted to identify any slopes that still pose a fall risk to cattle and/or humans. Fencing and signage will then be	At completion of earthworks	• Certification from an appropriately qualified and experienced person to confirm slopes are safe and

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
			installed, and a final site assessment to confirm the satisfactory installation of both fencing and signage will be undertaken, with signoff and certification of such by an AQP.		suitable fencing and signage is installed.
RM3 Surface preparation completed	All areas except RA19, RA20, RA22, RA23	Visual inspections during the works	Visual inspections of the works area while works are being completed to confirm: • Works are proceeding according to the planned design, including installation and maintenance of appropriate erosion and sediment controls and surface ripping • No significant erosion features present • No visible dust moving off-site that could cause environmental harm or nuisance.	Weekly during site works	• Visual inspection sheets, photographs
		A volumetric assessment of available soil resources for surface preparation works.	A volumetric assessment is to be completed (by survey or other similarly suitable method) of all soil stockpiles, along with confirmatory testing of all rehabilitation areas, confirming required subsoil application depth (if any) and quantities of subsoil and topsoil required. Following this, an assessment of the required volumes and source for any makeup volume required is to be determined and documented within the assessment report, along with haulage routes.	Prior to any works in RM3 commencing	• Electronic records of the volumes, timing and soil particulars maintained • GIS files recording the location of relevant soil stockpiles and spreading, and test sites • Topsoil Report prepared
		Soil health and suitability assessment of topsoil stockpiles prior to spreading.	A soil health and suitability assessment report prepared by an AQP to confirm soil is suitable for target vegetation establishment. This will include assessment of topsoil and subsoil stockpiles prior to placement, along with remediation requirements; field testing of soil placement locations to confirm the depth of	Soil stockpile assessments within six months prior to spreading Soil testing one month	• Soil health and suitability assessment report(s)

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
			subsoil required to be added (if any); and follow up validation assessment of in-situ soils after placement.	following soil placement (and confirmation of appropriate depths, amelioration)	
		Visual inspections to confirm surface ripping and preparation completed	Visual inspections, including photographs, of all areas prior to soil addition, to provide confirmation that surface preparation works have been completed as required, including ripping of surfaces.	During ripping and surface preparation	• Visual inspection sheets, photographs
		Tracking of soil volumes, application and amelioration	Details of testing, movement and spreading of soils are to be made and retained, including: • Remaining soil stockpile quantities, to track volumes and ensure deficits do not occur • The area and dates where soil has been applied • Results of testing to confirm applied depths of soils meet the design plans, including photographs and locations of test sites • Quantity and type of mulch and/or fertiliser applied, and the location of the application (i.e. soil areas above).	During / following soil application	• Electronic records of inspections, photographs, fertiliser, mulch etc. application rates and types • GIS files of area of application, stockpile locations • Electronic register of source and destination for all soils, linked to GIS files
		Weed monitoring	Regular weed monitoring to allow the early detection and treatment of new weed infestations during stockpile assessments and surface preparation works.	Monthly during site works	• Weed monitoring report
		Visual inspections after completion of earthworks	Visual inspection of all earthworks areas after completion for any instances of degradation, erosion or earthworks failure. Inspection to include presence of sediment plumes and	On completion of earthworks and monthly thereafter	• Visual inspection records, including photographs

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
			evidence of accumulation of sediment within drainage lines or impoundments. Inspect site for visible dust moving off-site that could cause environmental harm or nuisance.	(until completion of RM)	• Records of maintenance to ensure as constructed landform complies with approved designs.
		Groundwater monitoring in nominated groundwater monitoring bores	Continue monitoring of water level and water quality in nominated water bores. Report to be prepared by an AQP that groundwater shows no deterioration from baseline conditions		• Groundwater quality and quantity database • Assessment report by an AQP
RM4 Revegetation	All areas other than RA19, RA20, RA21, RA22, RA23	Visual inspections of revegetation works	Visual inspections and retention of records must be undertaken during the revegetation works confirming the works are proceeding as planned. This will include confirmation that the following requirements are met: • Fertiliser application rate, as specified in the soil health and suitability assessment report (RM3) • Rate of seed application (kg/ha) for each seed type and mix of seeds applied • Timing of seed application (i.e. date, season, climatic conditions) • Seed application method and any cover requirements • Mulching of sparse woodland areas • No active significant erosion occurring.	Weekly during sowing	• Visual inspection sheets, photographs
		Weed monitoring	Regular weed monitoring of revegetation areas to allow the early detection and treatment of new weed infestations during planting activities.	Monthly during site works	• Weed monitoring report
		Monitoring of firebreaks	The site should contain suitable firebreaks to control for fire and the risk of damage to the revegetation works. Ongoing visual monitoring	6-monthly	• Visual inspection sheets, photographs

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
			of firebreaks, coupled with remediation where required (clearing etc.) is required to maintain firebreaks in an optimal condition.		• Entry of any identified issues into incident/remediation register
		Tracking of revegetation practices and successes / remediation works	Tracking of information obtained from visual inspections and records detailed above.	Updated as each revegetation area is completed	• GIS files of area of application, test locations, outcomes, linked to register above • A register of: - applied fertiliser and seed (type and amount) - date of application - area of application (link to areas in spatial database)
RM5 Vegetation is established	All areas other than RA19, RA20, RA21	Assessment of reference and test sites.	A documented report by an AQP detailing the assessment of a representative number of test quadrats within transects in both test (i.e. revegetation areas) and reference sites. This sampling is to identify: • Groundcover density and species dominance. • Stem density of target species • For forest and sparse woodland areas, presence and number of target woody species.	6-months after revegetation is completed in an area	• Groundcover density and species dominance report prepared by an AQP
		Weed monitoring	Weed monitoring of revegetated areas to allow the early detection and treatment of new weed infestations.	Annually	• Weed monitoring report
		Visual inspections for erosion features and signs of land	Visual inspections must be conducted to check:	6-monthly	• Visual inspection sheets, photographs

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
		degradation or instability, areas of bare exposed soil	• for the presence of erosion features - active rill, gully or sheet erosion • Drainage is following appropriate drainage paths • For areas of exposed soil. Should any of these be identified, rectification works must be initiated to ensure the success of revegetation and to avoid instability and deterioration of land surfaces.		• Entry of any identified issues into incident/remediation register
		Monitoring of firebreaks	The site should contain suitable firebreaks to control for fire and the risk of damage to the revegetation works. Ongoing visual monitoring of firebreaks, coupled with remediation where required (clearing etc.) is required to maintain firebreaks in an optimal condition.	6-monthly	• Visual inspection sheets, photographs • Entry of any identified issues into incident/remediation register
RM6 Final sustainable landform achieved	All areas	Assessment of carrying capacity of final landform	An assessment by an appropriately qualified and experienced person, taking into account the pasture type and density, pasture mass available and landform, of the sustainable carrying capacity for low intensity cattle grazing on the site.	3 years after revegetation is completed in an area	• Assessment report by an AQP
		Assessment of reference and test sites	A documented report by an AQP detailing the assessment of a representative number of test quadrats within transects in both test (i.e. revegetation areas) and reference sites. This sampling is to identify: • Groundcover density and species dominance. • For forest and sparse woodland areas, presence and number of target woody species.		• Groundcover density and species dominance report prepared by an AQP

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
		Assessment of land suitability class	An assessment by an AQP to measure and determine the land suitability class of the rehabilitated site, to meet the requirements for low intensity grazing land.	3 years after revegetation is completed in an area	• Assessment report by a AQP
		Weed monitoring	Weed monitoring of revegetated areas to allow the early detection and treatment of new weed infestations.	Annually	• Weed monitoring report
		Water quality monitoring in surface water impoundments	Final assessment report by an AQP to detail whether water quality meets the water quality targets. Determine remediation requirements where not met.	3 years after revegetation is completed in an area. Where remediation is required, quarterly for 2 years after achievement of water quality targets or as otherwise recommended by the report	• Surface water quality database • Assessment report by an AQP
		Groundwater monitoring in nominated groundwater monitoring bores	Final assessment report to be prepared by an AQP that groundwater shows no deterioration from baseline conditions.	3 years after revegetation is completed in an area. Where target not achieved, quarterly for 2 years after achievement of water quality	• Groundwater quality and quantity database • Assessment report by an AQP

Rehabilitation Milestone	Areas to be monitored	Monitoring Element	Description of Monitoring	Timing	Milestone records
				targets or as otherwise recommended by the report	
		Visual inspections for erosion features and signs of land degradation or instability, areas of bare exposed soil	Visual inspections must be conducted to check: • for the presence of erosion features - active rill, gully or sheet erosion • Drainage is following appropriate drainage paths • For areas of exposed soil. Should any of these be identified, rectification works must be initiated to ensure the success of revegetation and to avoid instability and deterioration of land surfaces.	3 years after revegetation is completed in an area. Where target not achieved, annually for 2 years after achievement of target	• Visual inspection sheets, photographs • Entry of any identified issues into incident/remediation register

8.4 Surrender

8.4.1 Final Rehabilitation Report

A final rehabilitation report is to be prepared when applying to surrender the EA. The purpose of this final rehabilitation report is to demonstrate that the conditions of the EA have been complied with, and that rehabilitation of disturbed land has been carried out satisfactorily. The requirements of the final rehabilitation report are listed in section 269A of the *Environmental Protection Act 1994*.

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Appendix 1

PRCP Schedule

Appendix 2

Environmental Authority EPML0162913

Appendix 3

Brolga Rehabilitation Management Standard

Appendix 4

Water Assessment

Appendix 5

DES Environmental Reports

Appendix 6

Site condition report for ML5864 (Canoona)

Appendix 7

Consultation - LSC and Landholder letter

Appendix 8

Landholder acceptance of responsibility for remaining infrastructure

Appendix 9

GNP SEIS Appendix B – Residue Geochemical Characterisation

Appendix 10

Ore Waste Rock Analyses

Appendix 11

Geotechnical Assessment of the Brolga Project

Appendix 12

Ecosystem Function Analysis (EFA) for ML5866 (Brolga)