BARALABA SOUTH

Baralaba South Project

Environmental Impact Statement

CHAPTER 3

Rehabilitation

arc ENVIRONMENTAL SOLUTIONS

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3 Rehabilitation

This chapter outlines the key factors relevant to rehabilitation and closure for the Project and describes the approach to rehabilitation and closure to be taken by the Proponent. It draws on inputs from a number of other EIS chapters, in particular:

- Chapter 12, Land and Visual Amenity;
- Chapter 14, Waste Management;
- Chapter 7, Flora and Fauna;
- The Draft Progressive Rehabilitation and Closure Plan (Appendix AA); and
- various related technical studies included as appendices to this EIS.

3.1 Relevant policy and legislation

3.1.1 Progressive rehabilitation

The EP Act sets out strict progressive rehabilitation requirements on mines operating in Queensland.

Amendments to the EP Act in late 2018 implemented key elements of the State Government's 'Mined land rehabilitation policy' (DEHP *et al.*, n.d.), which ensures that land disturbed by mining activities is progressively rehabilitated to a safe and stable landform that does not cause environmental harm and is able to sustain an approved post-mining land use. The amendments gave rise to a prescriptive mine closure regime, incorporating enforceable progressive rehabilitation milestones for all areas of potential impact.

This chapter has been prepared to assist the DES in carrying out the environmental objective assessment in respect of the environmental objective for land in Part 3 of Schedule 8 of the EP Regulation (that is, the activity protects the environmental values of land), by achieving the following relevant performance outcomes:

- activities that disturb land, soils, subsoils, landforms and associated flora and fauna will be managed in a way that prevents or minimises adverse effects on the environmental values of land; and
- areas disturbed will be rehabilitated or restored to achieve sites that are safe and stable, where no environmental harm is being caused by anything on or in the land, and that are able to sustain an appropriate land use after rehabilitation or restoration.

In addition, under the new regime, a PRC Plan must be prepared for the Project that complies with Division 3, Part 2 of Chapter 5 of the EP Act. The PRC Plan will apply for the life of the Project, and must:

- outline each proposed post-mining land use (PMLU) and, where applicable and approved, any non-use management area (NUMA) for the Project site;
- include a PRC Plan schedule of binding rehabilitation milestones for each PMLU and, where applicable and approved, any NUMA management milestones, including dates for completion of each milestone and criteria to demonstrate satisfaction of the milestones. The PRC Plan schedule must provide for the completion of rehabilitation or management milestones as soon as practical after the land becomes 'available for rehabilitation';
- detail and justify the rehabilitation methods and techniques to achieve the rehabilitation and management milestones;
- detail the consultation undertaken with the community in preparing the PRC Plan, and ongoing consultation in relation to the rehabilitation to be carried out; and
- include various management plans in relation to water and waste management, revegetation, void closure, and rehabilitation monitoring.

Once approved, the Proponent is required to implement the PRC Plan and meet the rehabilitation milestones set out in the PRC Plan schedule. DES is empowered to enforce the rehabilitation milestones.

As the EA application for the Project was made prior to the commencement of the PRC Plan provisions of the EP Act, neither the EA application, nor this EIS, is required to be accompanied by a draft PRC Plan. Instead, the Proponent has agreed to separately prepare a draft PRC Plan for the Project to facilitate the approvals process.

This chapter, along with related supporting chapters and technical studies, has been prepared in consideration of the requirements of the EP Act, PRC Plan and other relevant guidelines; as well as best practice approaches to rehabilitation.

3.1.2 Financial provisioning

At the time that an EA is issued for the Project, the estimated cost to rehabilitate and restore the environment in relation to the resource activities under the EA will be calculated, and an application made to DES for a decision on the estimated rehabilitation cost in accordance with section 298 of the EP Act. As per section 297 of the EP Act, it will be a condition of the EA that the Proponent must not carry out a resource activity unless an estimated rehabilitation cost decision is in effect and the Proponent has made the relevant contribution to the financial provisioning scheme, which will secure the Proponent's rehabilitation obligations.

3.2 Key influencing ecosystem processes and functions

3.2.1 Landscape, landform, hydrology and climate

The Project area is described as predominantly flat and slightly undulating with elevations ranging between 75 m and 110 m. Two distinct topographical features dominate the Project area:

1) The Dawson River and the Banana Creek floodplain located in the western portion of the site; and
2) Mount Ramsay located approximately 400 m outside the eastern boundary of the MLA.

The Dawson River, at its closest point, is approximately 2 km west of the Project and is one of six major river catchments within the Fitzroy drainage basin; eventually flowing into the Great Barrier Reef. Near the Project site, the Dawson River flows north to northwest through a flat, alluvial floodplain. Banana Creek is located along the southern and south-western extents of the Project and flows into the Dawson River. An anabranch of the Dawson River lies to the north of the Project, re-joining the main channel 5 km downstream from the Neville-Hewitt Weir.

The landscape of the Project area has been highly modified, mostly by historic grazing activities. Brigalow and Coolibah-Black Box Woodlands are present within the Project area in small, isolated patches, most of which are associated with the drainage lines that occur throughout the western portion of the Project.

The climatic aspects of the Project site of most relevance to rehabilitation outcomes and erosional impacts can be summarised as follows:

- a typical wet season occurs between November and March of each year, approximately coinciding with the hotter summer months;
- average evaporation rates are typically three times greater than the average annual rainfall which, with the variation in rainfall commonly experienced, highlights that periods of moisture stress can regularly occur and impact on rehabilitation success rates; and
- high-intensity rainfall events are a factor impacting potential rates of erosion from disturbed and rehabilitated slopes. Analysis of the BoM’s 2016 Design Rainfall Data System indicates that short duration (i.e. less than five minutes), high-intensity storms of greater than 100 mm per hour would be expected in the Baralaba area of central Queensland, typically, once or twice each year (BoM, 2019c).

Rehabilitation methods, particularly surface preparation activities, revegetation species selection, revegetation timing and rehabilitation maintenance activities, need to be sufficiently robust to address the climatic challenges that exist in this region.

3.2.2 Spoil and coal reject geochemistry

The Project will generate approximately 636 Mbcm of waste rock and 9 Mbcm of coal rejects from the CHPP during the operational phase.

The Geochemical Assessment undertaken (Appendix E) has concluded that spoil material is expected to be overwhelmingly non-acid forming with an excess acid neutralising capacity and a resulting negligible risk of developing acid conditions. Given a median EC1:5 value of 302 µS/cm and a 90th percentile value of 505 µS/cm, spoil is expected to generate a low to medium-low salinity surface runoff/seepage when assessed using the soil salinity classifications contained within 'Technical guidelines for the environmental management of exploration and mining' (DME, 1995). All spoil samples reported total metals and metalloid concentrations below the 'National Environmental Protection (Assessment of Site Contamination) Measure 1999, health investigation levels for soil contaminants for land used for open spaces, parklands, etc. (HIL C)' (as amended, taking into account amendments up to the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)). The assessment identified that spoil materials may be sodic with a potential for dispersion and possible erosion. The waste rock is therefore regarded as posing a low risk of environmental harm.

With respect to coal reject materials, the Geochemical Assessment (Appendix E) identified that 3% of potential coal reject samples are classified as PAF and a further 33% as either uncertain or PAF-low capacity. 64% of potential coal reject samples classified as NAF. However, given that coal reject materials comprise less than 5% of all mineral wastes generated, the reject is regarded as posing a low risk of environmental harm. The assessment also identified that the low sulphur (and sulphide) concentrations within the material (and also the low metals/metalloids concentrations) suggests that the magnitude of any localised acid, saline or metalliferous drainage, were it to occur, is likely to be negligible.

3.2.3 Topsoil resources

Soil management units (SMUs) are described in Chapter 12, Land and Visual Amenity. In general, the surface soils to be reclaimed for use in rehabilitation topsoiling activities are of high pH and low-salinity, are non-sodic, have a variable potential to supply nutrients and range from moderate to high erodibility. A significant majority of topsoil reclaimed will originate from the Langley SMU, which was assessed as the highest quality topsoil on-site.

Based on stripping depths recommended by the Soils and Land Assessment (Appendix K), the maximum volume of topsoil able to be reclaimed from the study area for use in rehabilitation activities has a range of approximately 1,194,000-6,120,500m^3 (Table 3.1). Taking into account working tolerances of earthmoving equipment and allowing for a 10% handling loss, it is estimated that approximately 5,508,450 m^3 of topsoil resource will be recoverable and available for use in rehabilitation.

Based on a minimum recommended topsoil respreading depth of 0.20–0.25 m, a topsoil volume of up to approximately 2,675,000 m^3 will be required for rehabilitation efforts over the life of the Project. Based on the disturbance footprint within the MLA of 1,211 ha, up to 6,120,500 m^3 of soil resources will be available for rehabilitation. as such, sufficient topsoil material will be available for rehabilitation efforts. Due to the thin stripping depths recommended and the potential to improve rehabilitation success by using greater than 0.2 m depth of respread topsoil, diligence will be required in managing topsoil resources to ensure no wastage or deterioration. Measures to manage topsoil loss are set out in section 3.5.2.

Table 3.1: Estimated topsoil volumes available for rehabilitation

Soil management unit	Surface area to be disturbed (ha)	Stripping depth (m)	Estimated volume of recoverable topsoil (m^3)
Isaac	0	0.1–0.15	0
Langley	184	0.1–0.2	184,000-368,000
Bluchers	7	0.1–0.15	7,000-10,500
Stephens	4	0.1–0.15	3,500-5,500
Tralee	35	0.05–0.15	17,500-52,500
Greycliffe	155	0.1–0.2	155,500-310,500
Thalberg	827	0.1–0.65	826,500-5,374,000
Total	**1,211**		**1,194,000-6,120,500**

3.2.4 Current land use and land suitability

Current local land use is predominantly rural with a number of other coal mining operations existing in the area. A full description of existing land values, including land use suitability, agricultural land class and areas of regional interest, is provided in Chapter 12, Land and Visual Amenity.

The Project area is zoned as rural land use under the Banana Town Planning Scheme (Banana Shire Council, 2021), which allows for uses consistent with mining where the specific outcomes, including environmental considerations, amenity and separation distances, can be met.

The floodplain of the Dawson River and its tributaries makes up a large proportion of the prime agricultural land in the region surrounding the study area. The area to the west of the river is mapped as Priority Agricultural Area under the RPI Act. The floodplain areas are used for irrigated and rain-fed cropping and beef cattle grazing on improved pasture. Away from the floodplain, cattle are grazed on native or improved dryland pasture.

As identified in section 12.3, Chapter 12, Land and Visual Amenity, existing land use suitability for cropping within the Project disturbance footprint is defined as 'Class 4, agricultural land suitability (marginal land with severe limitations)' through to 'Class 5, agricultural land suitability (unsuitable land with extreme limitations)'. The cropping land suitability ratings are supported by the existing land uses of grazing on improved pastures.

The Project is located over eight freehold properties, three local road reserves and four state land leases. None of these have been identified as including Class A or Class B agricultural land.

3.3 Post-mining land use

The intent of the Proponent is to return disturbed lands to future landowners with a land use that conforms with existing local government planning instruments and is of an economic value at least equal to that existing prior to mining. Possible PMLUs have been identified and assessed in accordance with the guideline, 'Rehabilitation requirements for mining resource activities' (DES, 2018a), specifically with respect to the rehabilitation hierarchy, which is described within the guideline, in order of decreasing capacity to prevent or minimise environmental harm as follows:

1) avoid disturbance that will require rehabilitation;
2) reinstate a 'natural' ecosystem as similar as possible to the original;
3) develop an alternative outcome with a higher economic value than the previous land use;
4) reinstate the previous land use;
5) develop a lower value land use; or
6) leave the site in an unusable condition or with a potential to generate future pollution or adversely affect environmental values.

Given that land disturbance cannot be avoided for the Project, the Proponent's lowest hierarchical objective is to reinstate the land to the previous land use; in this case to a predominantly improved pasture grazing land use. The Social Impact Assessment (Appendix S) identified impacts on soil resources and mine rehabilitation as key issues raised by stakeholders, with grazing land/ agricultural purposes nominated as the most appropriate land use for the Project site post-mining. This PMLU was indicated as having long-term and substantial value to the local community.

While available topsoil resources may have the effect of limiting the depth of topsoil able to be replaced, the absence of any other significant limiting factors inherent in the topsoil resources indicates that rehabilitated landforms will be capable of sustaining the improved and native pastures required for this PMLU. Grazing activities may be able to be further supported by retaining certain Project infrastructure, such as dams and tracks, with a view to adding to the economic value of the land to be relinquished.

Given the final landform proposed, alternative PMLUs need to be identified for the residual void highwalls and pit lake features, which will not be able to sustain a grazing land use. A number of alternative PMLUs have been identified and assessed with the following PMLU options being subjected to initial feasibility assessments:

- reinstatement of improved pasture grazing activities (i.e. rehabilitation hierarchy level 4), with the residual void highwalls and pit lakes rehabilitated to become natural, novel native ecosystems providing habitat and ecosystem services to local flora and fauna (i.e. rehabilitation hierarchy level 2);
- complete backfilling of the pit void and reinstatement of improved pasture grazing activities (i.e. rehabilitation hierarchy level 4) across the Project site; and
- development of a solar photovoltaic farm and pumped-storage hydro-electric scheme (i.e. rehabilitation hierarchy level 3); complementary to an improved pasture grazing use, and retention of the final void.

The results of the initial feasibility assessments of these alternatives are discussed in the following sections.

3.3.1 PMLU alternative 1: Improved pasture grazing, with pit lake and highwall 'natural' ecosystems

Reinstatement of an improved pasture grazing land use is considered to be a feasible PMLU for the majority of the Project site. As described in section 3.3, certain landform features are not suited to a grazing land use. For these features, notably a pit lake within the final void and surrounding highwall, a natural ecosystem land use is proposed. This PMLU arrangement is shown in Figure 3.1.

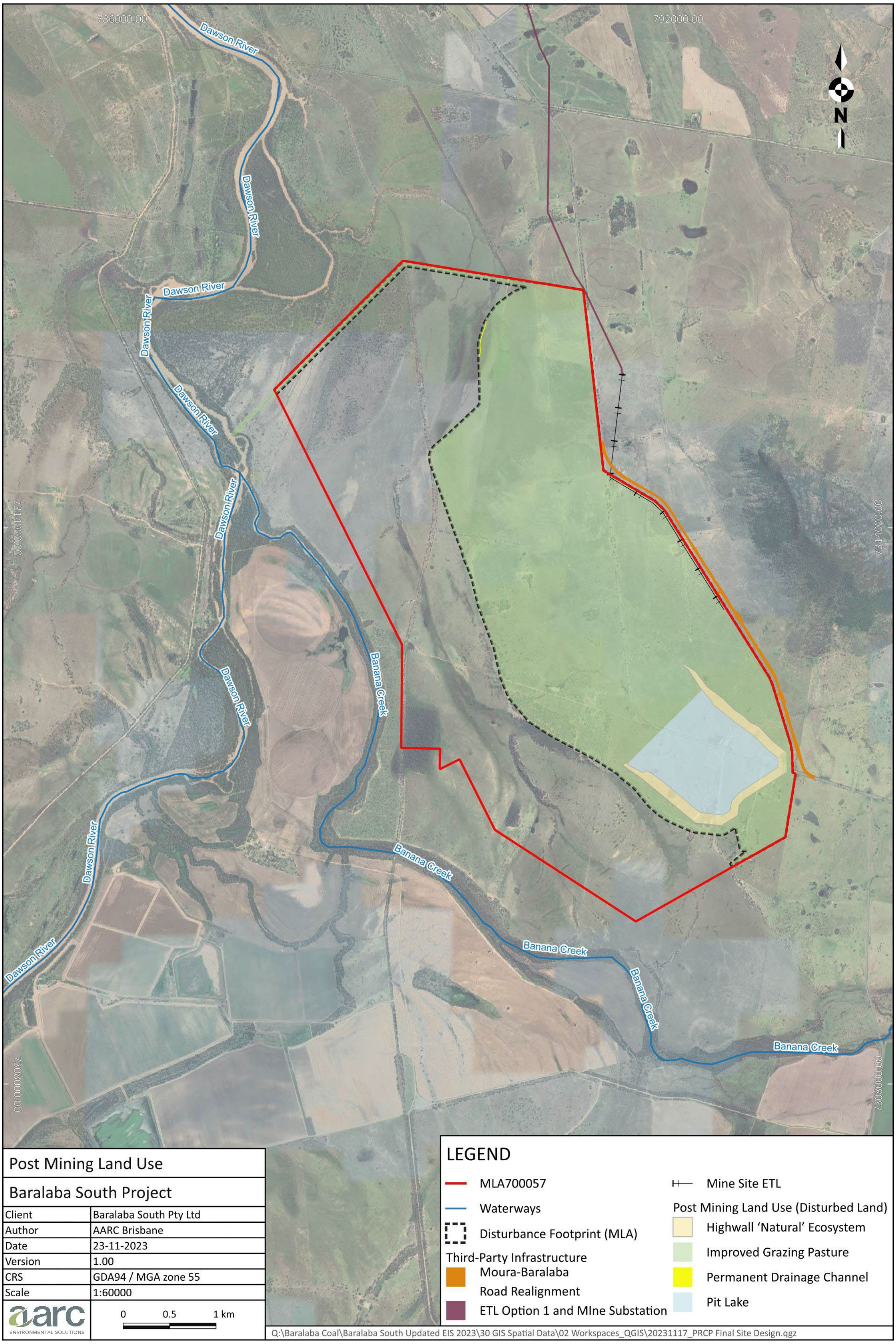


Figure 3.1: PMLU alternative 1: improved pasture grazing with natural ecosystem

The pit lake formed as part of the final landform is anticipated to have an area of approximately 66 ha. Pit lakes have demonstrated capacity for the development of ecosystems able to behave similarly to natural wetlands (Lund and Blanchette, 2014). The underlying biophysical processes facilitating primary production are critical in allowing pit lakes to evolve into valuable ecosystems (Luek and Rasmussen, 2017; Marszelewski *et al.*, 2017; Lund and Blanchette, 2014). Variables that influence primary production include bankside vegetation, nutrient concentrations in the water column (nitrogen, phosphorus and carbon), hydrology and bathymetry (Lund and Blanchette, 2014). Primary production processes can be assisted through rehabilitation activities such as planting vegetation below the final void water level, increasing the input of nutrients from leaf litter and improving the biodiversity of the system (Blanchette *et al.*, 2020).

Typically, pit lakes will become increasingly saline over time (i.e. waters having a TDS greater than 5,000 mg/L). Water quality modelling for the Project conducted by Engeny (Appendix A, Surface Water Impact Assessment) indicates that under the clean catchment inflow modelled scenario, the salinity of the pit void will gradually increase from 1,500 mg/L to 5,560 mg/L in the first 100 years following mining increasing slightly to 5,850 mg/L at equilibrium, 500 years post-mining. That is, the pit lake is likely to remain brackish for approximately the first 500 years. Biodiversity is often assumed to decrease as salinity increases, however, salinities of up to 10,000 µs/cm (equivalent to a TDS of approximately 6,400 mg/L) can support robust ecological systems and provide a valuable refuge for a range of species (pers comms. M. Lund, December 2019).

Research indicates that pit lakes in the earlier stages of ecological development (TDS up to approximately 4,500 mg/L) can provide ecological value for regional species in central Queensland (Proctor and Grigg, 2006). Further, pit lakes may act as a water refuge during periods of low rainfall for mobile species such as the Grey Teal Duck (Hart, 1991) which was recorded within the Project site (Appendix F, Terrestrial Ecology Assessment). Species of ducks and swans are regularly observed in saline pit lakes of open cut coal mines in central Queensland (pers comms. C. Cote, March 2020).

Macroinvertebrates are well-adapted to brackish and brackish-saline conditions; however, species diversity typically decreases with higher rates of salinity. A study of pit lakes aged from 1-22 years and ranging from 330 µs/cm–4,416 µs/cm, associated with a nearby open cut coal mine in Moura, indicated that the diversity of aquatic invertebrates was similar to nearby natural waterbodies (Proctor and Grigg, 2006). The pit lakes studied by Proctor and Grigg (2006) were reported to support orders of macroinvertebrates that have been recorded on the Project site, including Diptera, Hemiptera, Odonata, Coleoptera and Mollusca (Appendix G, Aquatic Ecology Assessment).

Brackish to saline pit lakes with similar groundwater quality and geological setting as anticipated/modelled for in the Project have been observed to support communities of macroinvertebrates, as well as small fish, bird life and turtles (pers comms. J. Fittler, March 2020). In an open cut coal mine located within the Fitzroy Basin, native fish including Western Carp Gudgeon, Spangled Perch and Firetail Gudgeon have been documented to have pioneered pit lakes with TDS of up to 7,600 µs/cm (pers comms. J. Fittler, March 2020); these species of fish were recorded by the aquatic ecology survey conducted for the Project (Appendix G, Aquatic Ecology Assessment).

Proctor and Grigg (2006) concluded that in central Queensland, final void waterbodies have the potential to provide habitat for many invertebrate taxa typical of still inland water bodies. The ability for macroinvertebrates in freshwater systems to adapt to changes in salinity is dependent on the period of acclimation where the ability to adapt to new conditions improves when changes are incremental over time (Hart *et al.*, 1991).

In periods of low rainfall, birds, including the Grey Teal, have been recorded using saline waters as refuges over both short- and long-term periods by drinking freshwater elsewhere (Lavery, 1972). Several species of birds prefer to breed in saline conditions (Goodsell, 1990). For example, the Grey Teal, Pacific Black Duck, White Faced Heron, Little Black Cormorant and Little Pied Cormorant were found by Goodsell (1990) to breed in saline conditions with TDS of up to between 14,600 mg/L (Pacific Black Duck) and 37,600 mg/L (Grey Teal). All of these species have been recorded within the Project site (Appendix F, Terrestrial Ecology Assessment). Further, the Black Swan, a species known to inhabit the wider Project surrounds, was reported by Goodsell (1990) to breed in saline water with a TDS of up to 43,500 mg/L.

The highwalls associated with pit lakes can also provide suitable refuge and brooding habitat for several fauna species. The residual highwall provides steeper slope habitat that can be used by native nesting birds. For example, a resident Peregrine Falcon pair has been recorded successfully breeding in nests created in the highwalls of an open cut mining pit in the Northern Territory (Potts and Donato, 2008). Additional individual Peregrine Falcons were observed utilising the various open pit highwalls for roosting. Birds documented to nest on inland, flat land or slopes may utilise the highwall pit slopes as nesting habitat (O'Donnell and Debus, 2012). The White-bellied Sea-eagle *Haliaeetus leucogaster* is one example of a species that nests on inland, flat land or slopes and has been recorded in the Project region (Appendix F, Terrestrial Ecology Assessment). Anecdotally, birds of prey have been reported to utilise the highwall as refuges in an open cut coal mine located in central Queensland; the Wedgetail Eagle, a species that has been recorded on the Project site is one example of such species of bird of prey (pers comms. J. Fittler, March 2020). Over time, an increase in bird life has been observed in response to an increase in fish abundance within the pit lake (pers comms. J Fittler, March 2020).

Insectivorous bats have been documented feeding on insects in the airspace above pit lakes in both Western Australia and central New South Wales (Griffiths *et al*., 2014a; Griffiths *et al*., 2014b). A number of insectivorous bats have been identified on the Project site by ANABAT surveys including the Chocolate Wattled Bat, Eastern Bent-winged Bat, Eastern Cave Bat, Eastern Freetailed Bat, Goulds Wattled Bat, Inland Broad-nosed Bat, Inland Forest Bat, Little Broad-nosed Bat, Little Pied Bat, Long-eared Bat, Northern Freetail Bat, Troughton's Sheathtail Bat, White-striped Freetailed Bat and the Yellow-bellied Sheathtail Bat (Appendix F, Terrestrial Ecology Assessment). Two additional species, the Gould's Long-eared Bat and the Eastern Horseshoe Bat have been recorded within the wider surrounds (Appendix F, Terrestrial Ecology Assessment). The rock fissures and crevices present in the highwall pit slopes may provide potential roosting habitat for various microbats identified within the Project site (e.g. Little Broad-nosed Bat) which roosts in hollows but which has been found in fence posts and under the metal caps of telegraph poles (Churchill, 2008), Gould's Wattled Bat which has been found roosting in stumps, hollow trees and urban settings such as ceilings (ALA, 2020) and the Troughton's Sheathtail Bat which has been recorded in cracks and crevices in rocky escarpments (DES, 2011), as well as species previously recorded within the Project region (e.g. the Eastern Horseshoe Bat which is known to roost in caves but also in holes and cracks in rocks [Australian Museum, 2020]).

Native vegetation proposed to rehabilitate the low wall slopes will provide additional refuge for ground-dwelling fauna, including small mammals and reptiles. For example, the Delicate Mouse (Pseudomys delicatulus) feeds on native grass seeds and uses grass tussocks as refuges (Diete *et al.*, 2015). Similarly, grass tussocks provide refuge for a number of mammals and reptile species found on the Project site during the fauna survey, including the Delicate Mouse, Common Planigale, Northern Brown Bandicoot, Bynoes Gecko and the Elegant Snake-Eyed Skink and the Open-litter Rainbow Skink (Appendix F, Terrestrial Ecology Assessment). The use of low wall vegetation by goats, cattle, small mammals and reptiles has been observed in opencut mines of Queensland (pers comms. C. Cote March 2020).

The ecological value of pit lakes and adjacent highwall features can be facilitated through effective rehabilitation of the pit walls. For example, in a review of the ecological processes associated with nutrient webs of natural lakes, wetlands and pit lakes, van Etten (2011) concluded that rehabilitating vegetation along the low walls can assist with improving water quality, primary production and provide suitable habitat for aquatic and terrestrial fauna. Similarly, a study conducted on the pit lake district in Collie, Western Australia indicated the input of nutrients from vegetation supports and facilitates ecosystems within pit lakes (Blanchette *et al.*, 2020). In Queensland, littoral fringe aquatic plants have been reported to inhabit areas with consistent water levels in-pit lakes with salinities less than 10,000 µs/cm, (pers comms. J. Fittler, March 2020). Further, habitat complexity including the development of microclimates (van Etten, 2011) and additional habitat could be created through the addition of cleared vegetation (i.e. tree trunks) to both the low walls and the waterbody (Luek and Rassmussen, 2017).

A number of species which have been found on the Project site have been documented to inhabit rehabilitated areas of an open cut coal mine site including the pit voids within Queensland, these species include:

- Birds: Little Black Cormorant, Australian Pelican, White Faced Heron, Brown Quail, Grey Teal Duck, Pacific Black Duck, Wandering Whistling Duck, Plumed Whistling Duck, Wedgetail Eagle, Brown Falcon and Little Pied Cormorant.

- Reptiles: Broad Palmed Rocket Frog, Green Tree Frog, Salmon Striped Marsh Frog, Krefts River Turtle, Open-Litter Rainbow Skink and Bynoe's Gecko.
- Mammals: Common Planigale, Northern Brown Bandicoot and The Eastern Grey Kangaroo.
- Fish: Western Carp Gudgeon, Spangled Perch, Firetail Gudgeon and Rainbowfish species.
- Macroinvertebrates of the orders Diptera, Hemiptera, Odonata, Coleoptera and Mollusca (Proctar and Grigg, 2006) (pers comms. J. Fittler, March 2020).

Given that salinity is predicted to remain below 10,000 mg/L during the first 100-years of post-mining operations, the pit lake and surrounding highwall features are anticipated to provide suitable habitat for a range of native fauna, including a number of species recorded within the Project site and surrounds.

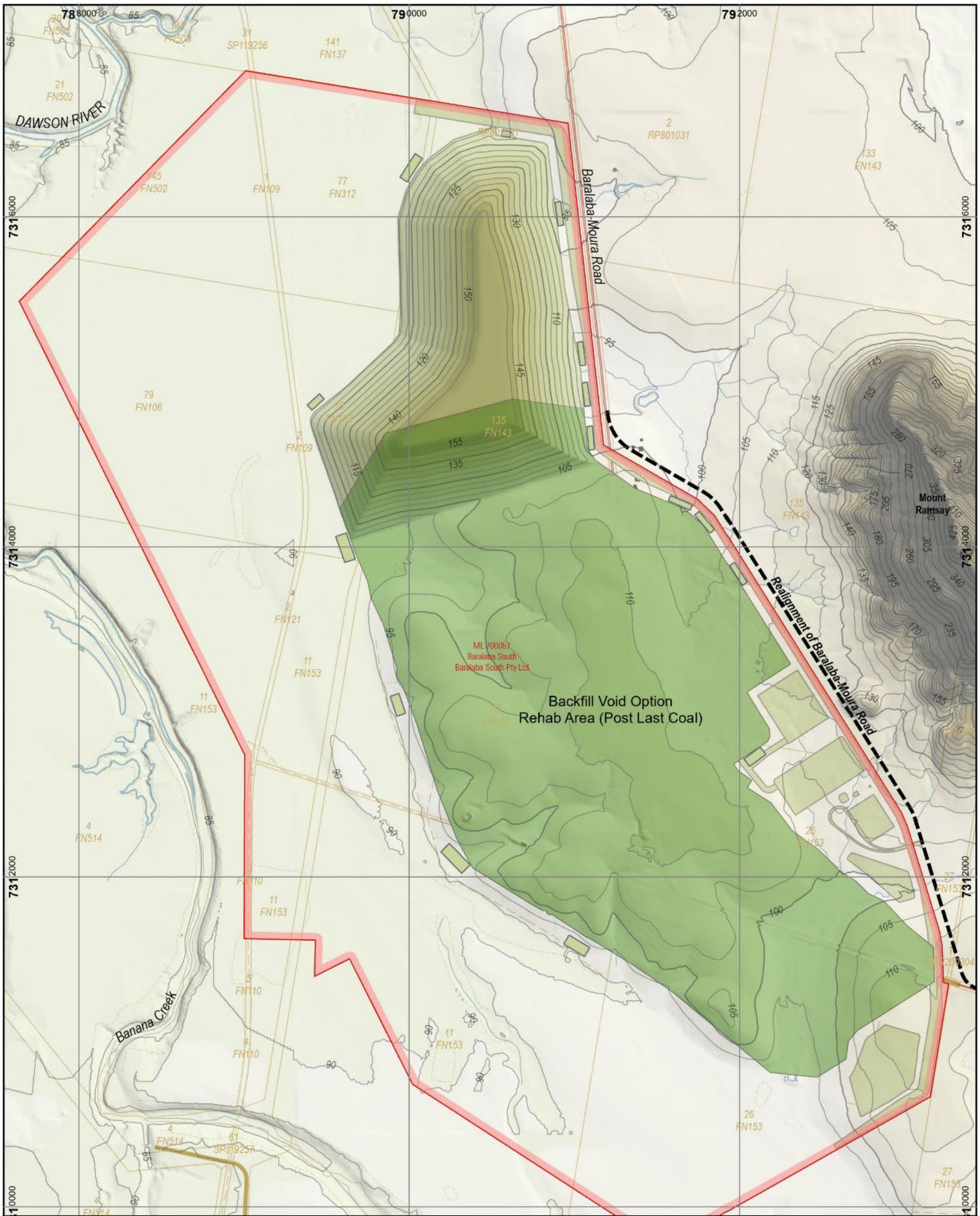
3.3.2 PMLU alternative 2: Improved pasture grazing, backfilled mine void

This alternative is based on backfilling of the final mine void to a level slightly higher than the original topography to allow for settlement over time. In this scenario, once a sufficient period has been allowed for settlement, the area would be shaped to an undulating landform with drainage features and then topsoiled and revegetated to the target PMLU of improved grazing pasture. The advantages of this alternative include avoidance of the need to stabilise low wall and highwall slopes or make safe the final void itself. The primary disadvantages with this option are:

- The significant cost of rehandling extremely large volumes of spoil at the end of mine life rendering the Project unviable.
- A simplified economic assessment of complete backfilling of the void was undertaken by comparing the total estimated cost for backfilling the void with the cost–benefit analysis findings from the economic impact assessment undertaken by AEC (refer also Chapter 16, Social and Economic). The cost–benefit analysis shows that, assuming a discount rate of 7%, the net present value of the Project (with a residual void) to the Queensland economy is estimated at \$715.6 million. The estimated cost for backfilling the void was determined by entering the final void surface area, low wall surface area, spoil rehandling area and the total backfill quantity required to re-establish the pre-mining topography (approximately 186,000,000 m^3 excluding settlement) (Figure 3.2), into the estimated rehabilitation cost calculator for mining (DES, 2023). Including Project overheads and contingency costs, the estimated cost to backfill the void was calculated to be \$910 million. The substantive difference between the Project benefit and the backfilling cost makes the Project non-viable. This PMLU alternative was therefore not considered further.
- An inability to undertake progressive rehabilitation of all but the northern out-of-pit waste rock emplacement until mine closure, as these waste rock emplacements would comprise the source of backfill material required. Under this option, these waste rock emplacements would need to be made safe from geotechnical failure and temporarily revegetated to mitigate sediment generation and windblown dust, along with additional water quality controls;
- The risk of ongoing differential settlement of the final landform surface potentially resulting in longer term drainage and stability issues.

3.3.3 PMLU alternative 3: Pumped-storage, hydro-electric scheme and solar power station

A further PMLU alternative for the Project area that has the potential to utilise the inherent value of certain retained features of the post-mining landform as well as some of the existing mining infrastructure is the development of a pumped-storage hydro-electric scheme and utility-sized solar power station.



Mine Domain	Area (Ha)	Volume (m3)	Earthwork $	Surface Treatment $	Total $	ERC Cost (inc OH)
Final Void Backfill to AOC	156.00	186,022,000.00	$ 723,696,308.82	$ 829,402.94	$ 724,525,711.76	$ 905,657,139.70
Low Wall Inpit Spoil Rehab	589.00		$ 1,207,120.59	$ 2,660,431.59	$ 3,867,552.18	$ 4,834,440.23
Total	**745.00**	**186,022,000.00**	**$ 724,903,429.41**	**$ 3,489,834.53**	**$ 728,393,263.94**	**$ 910,491,579.93**

Note: Calculation from DES ERC Calculator, Pits Tab (Ver 5.02)

Figure 3.2: PMLU alternative 2: improved pasture grazing

A pumped-storage hydro-electric scheme works by using solar-powered electric pumps to transfer water from a lower reservoir to a higher reservoir during periods of low energy demand. The water in the upper reservoir acts as a bulk electricity storage unit able to generate electricity on demand via a turbine and alternator. Examples of existing pumped-storage, hydro-electric schemes in Australia include the Snowy Mountains Hydro-electric Scheme and the Wivenhoe Power Station to the west of Brisbane. There are also a number of pumped-storage hydro-electric schemes at the development stage, with some of these proposing the use of open cut pits to provide the hydraulic differential required for efficient electricity generation.

For the Project, the pit lake could serve as the lower reservoir. The mine water dam located on the southern highwall may be suitable to operate as an upper reservoir, although a preliminary assessment indicates this may need to be increased in size to support this as a PMLU. Alternatively, a fit-for-purpose upper reservoir could be constructed within the final landform. Based on the estimated equilibrium water level, the height difference, or 'head', between the lower (pit lake) and upper reservoir would be at least 68 m, with potential to operate at significantly greater heads, given the depth of the pit lake. Key infrastructure, including the power station and piping, could be constructed either above or below ground, with the existing transmission line and parts of the MIA being converted for switchyards, transmission infrastructure and offices.

The preliminary assessment indicates that this arrangement could provide approximately 100 MW of power over a six-hour period. This capacity is of a size and timeframe able to benefit the National Electricity Market and is consistent with other pumped-storage hydro-electric schemes that are being proposed around Australia.

The slopes and landform proposed for the Project's waste rock dumps (WREs) are suitable for the development of a utility-sized solar power station. Initial estimates suggest a minimum area of 250 ha would be required which would be readily available at the rehabilitated site.

A range of factors towards the end of the mine life including electricity demand, as-constructed site suitability and market conditions would dictate the viability of conducting a pre-feasibility assessment into a pumped-storage hydro-electric scheme and solar power station alternative, and the nature of the assessment required. It would be appropriate to determine the need for and content of a pre-feasibility assessment of this option no sooner than 10 years before the end of mine life.

3.4 Rehabilitation strategy

3.4.1 Rehabilitation objectives

In accordance with the Queensland government's objectives defined in the 'Mined land rehabilitation policy' (DEHP *et al.*, n.d.), the general rehabilitation goals for the Project are to leave an area that is:

- safe;
- stable;
- does not cause environmental harm; and
- is able to sustain an agreed PMLU.

These goals align with the relevant performance outcomes for land rehabilitation in the EP Regulation.

In addition to the general rehabilitation goals listed above, further site-specific goals for the Project include:

- minimising the loss of pre-existing agricultural land value by reinstating, where possible, grazing lands at a similar suitability to that existing prior to mining;
- where this cannot be achieved, identifying alternative uses that provide a similar value to the value able to be generated from the land prior to mining or an alternative land use, or uses, able to provide long-term ecological value to the region; and
- minimising or avoiding the potential for post-mining lands having no or little value to the area or region.

The identification of preferred PMLU options must consider all of the key influencing ecosystem processes and functions summarised in section 3.2, as well as government planning constraints and a number of critical site-specific aspects—most importantly the proposed post-mining landform which introduces physical aspects that may be better or less suited to particular land uses. The site's projected landform at key intervals during the mine life is depicted in Figure 3.3 to Figure 3.9. The final landform is depicted in Figure 3.10, with a visualisation shown inFigure 3.11 and includes the following discrete rehabilitation areas:

- a single out-of-pit WRE;
- an in-pit WRE with an elevation up to approximately 60 m above natural landform, grading to the south and contiguous with the out-of-pit WRE;
- one residual void located at the southernmost extent of the pit; and
- mine infrastructure areas, including water infrastructure areas consisting primarily of water storage features.

These rehabilitation areas are described in the following sections, with a subsequent discussion on the development of PMLUs in section 3.3.

The staging of the mine plan and associated rehabilitation strategy set out below have been designed to:

- achieve the relevant performance outcomes;
- minimise the loss of land and water bodies with ecological and productive value; and
- ensure that high impact areas are capable of being managed and rehabilitated to:
    - achieve acceptable land use capability and suitability;
    - be stable and self-sustaining; and
    - prevent surface and groundwater contamination.

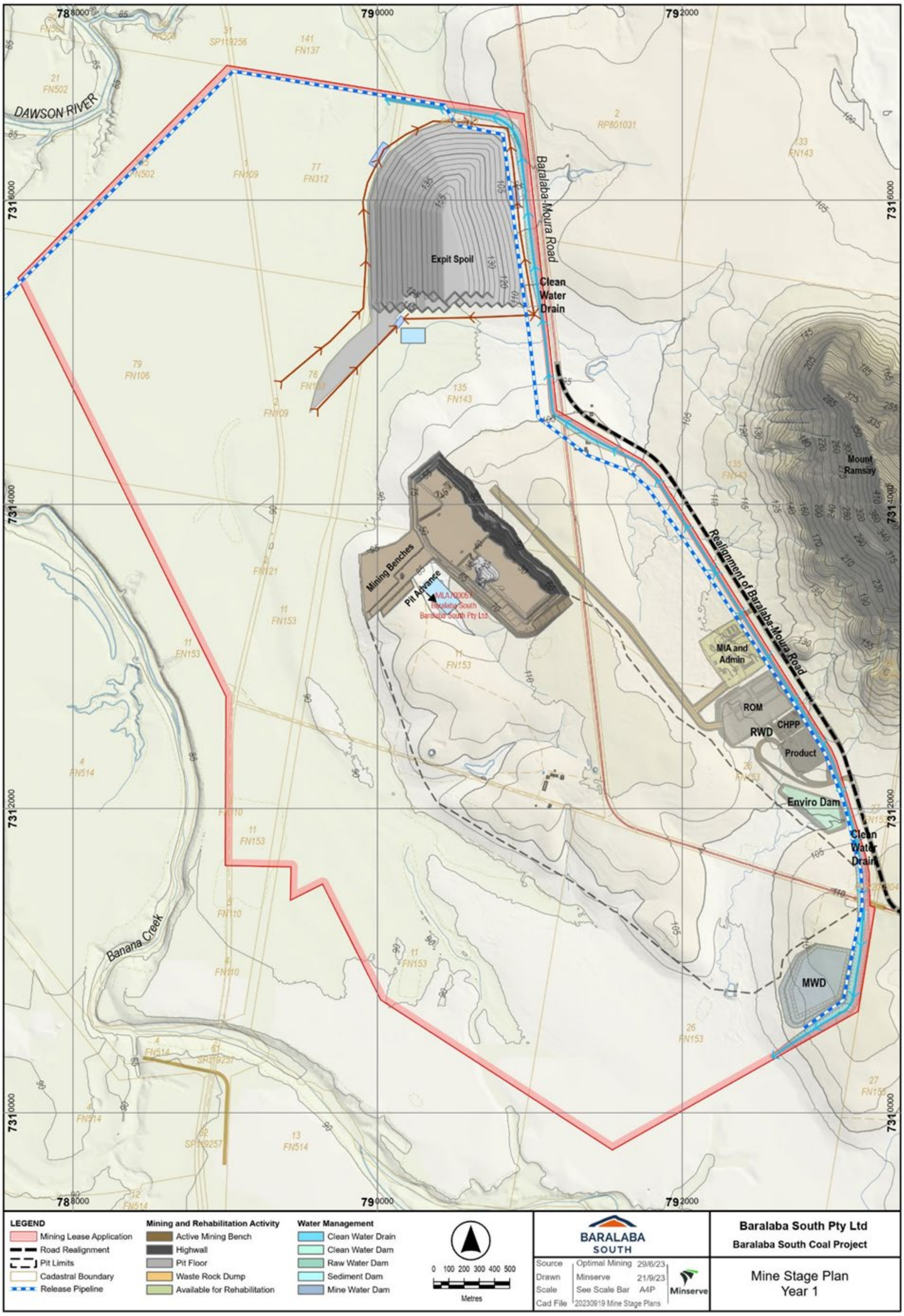


Figure 3.3: Mine stage plan—year 1

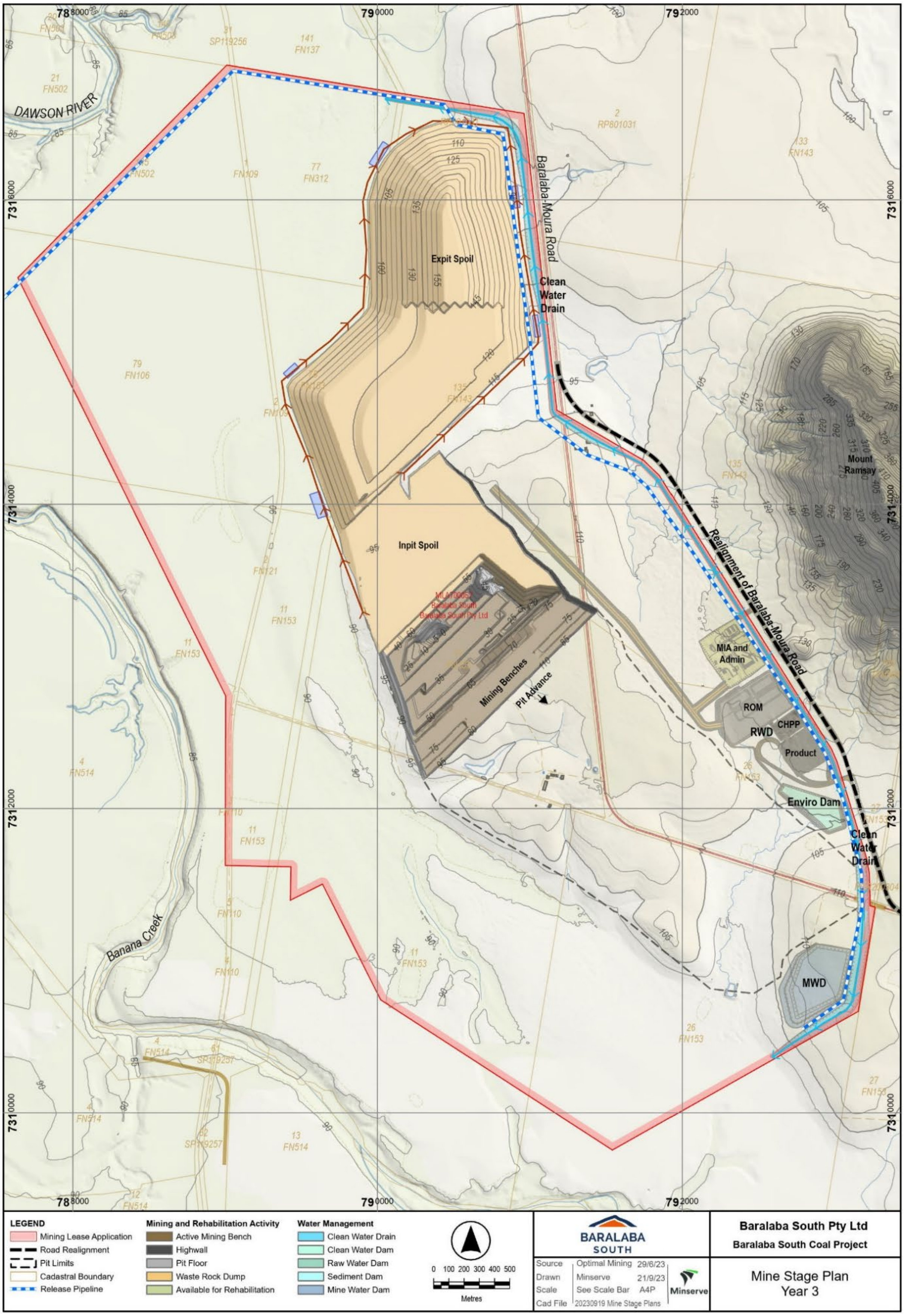


Figure 3.4: *Mine stage plan – year 3*

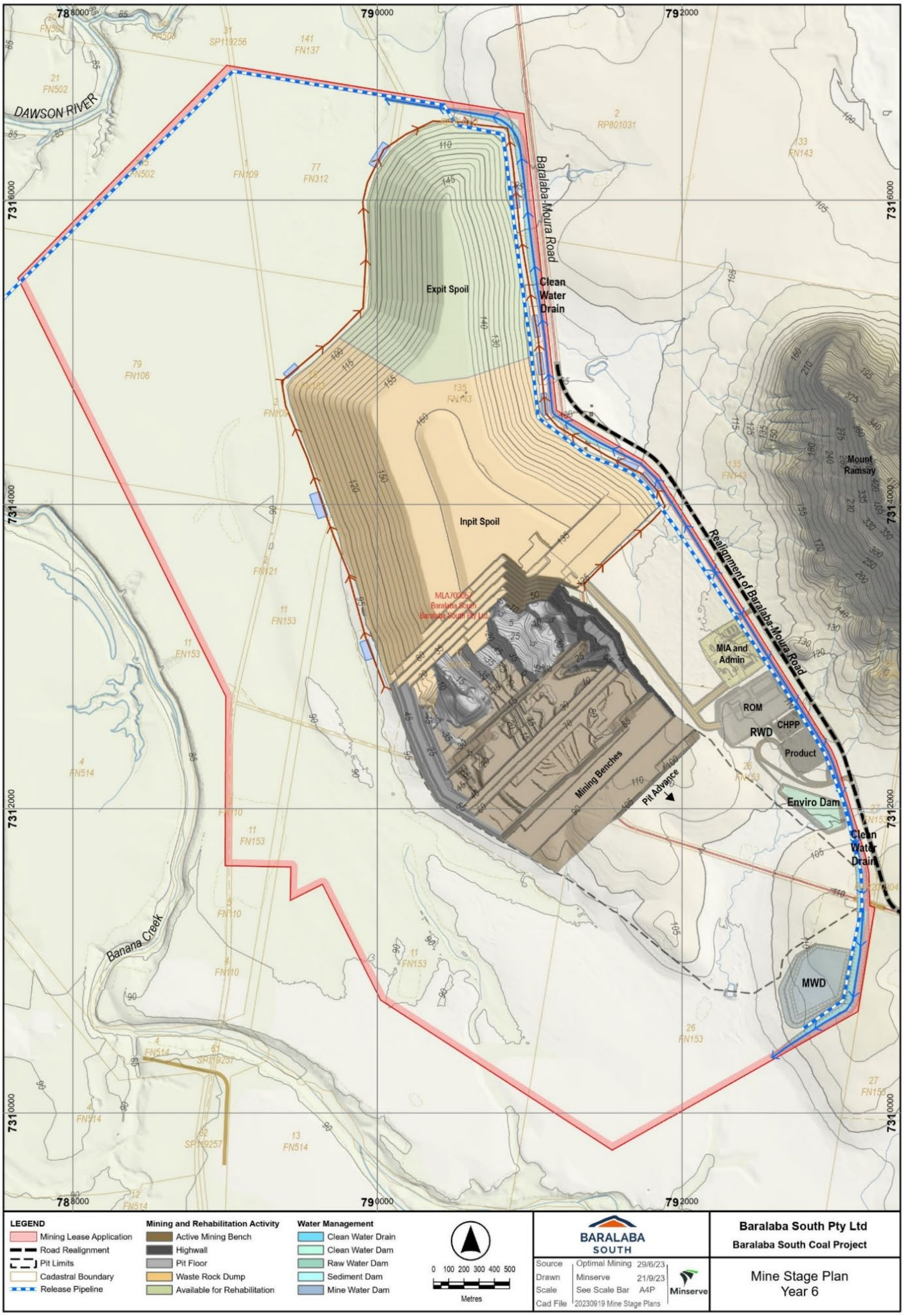


Figure 3.5: Mine stage plan—year 6

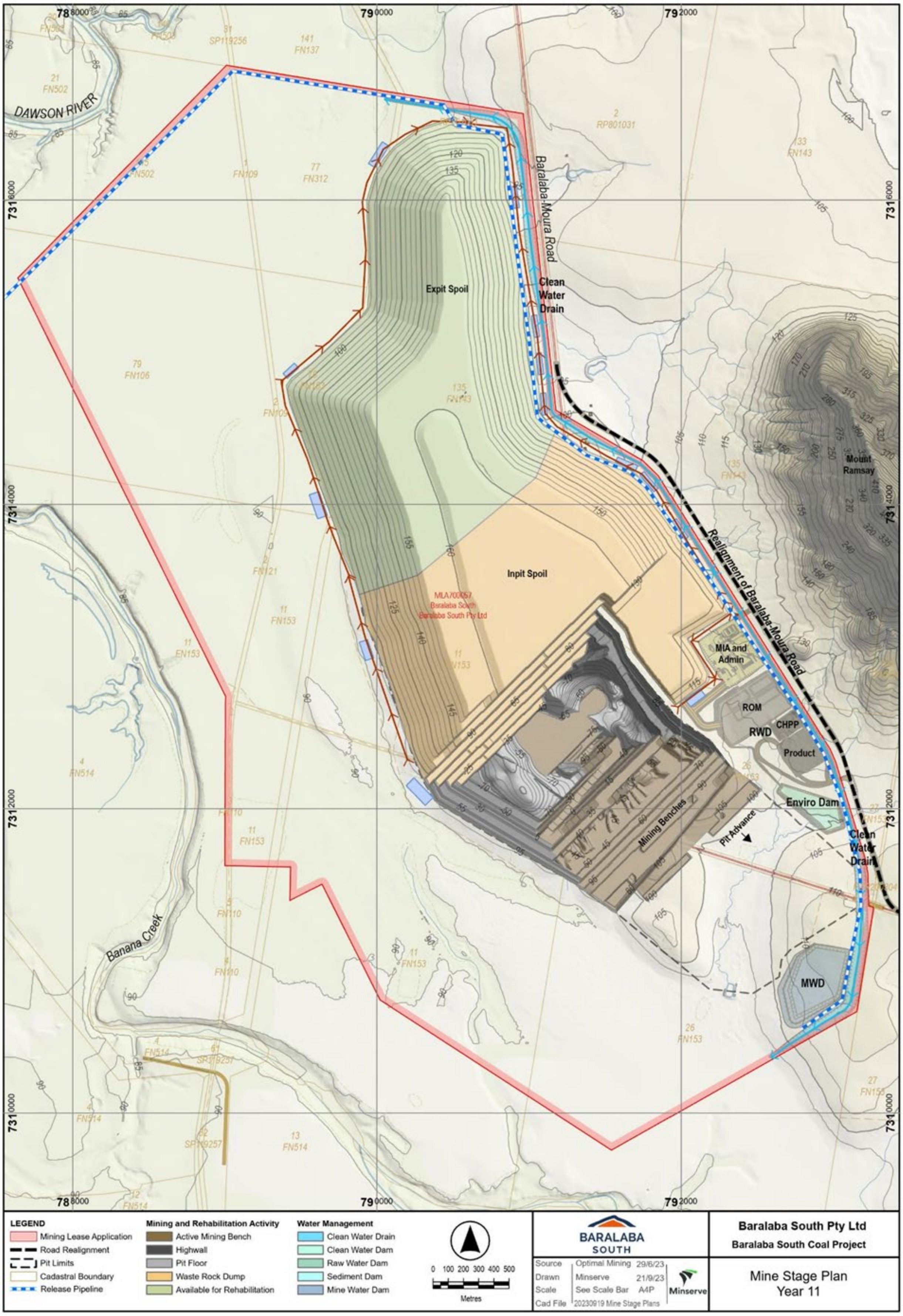


Figure 3.6: Mine stage plan—year 11

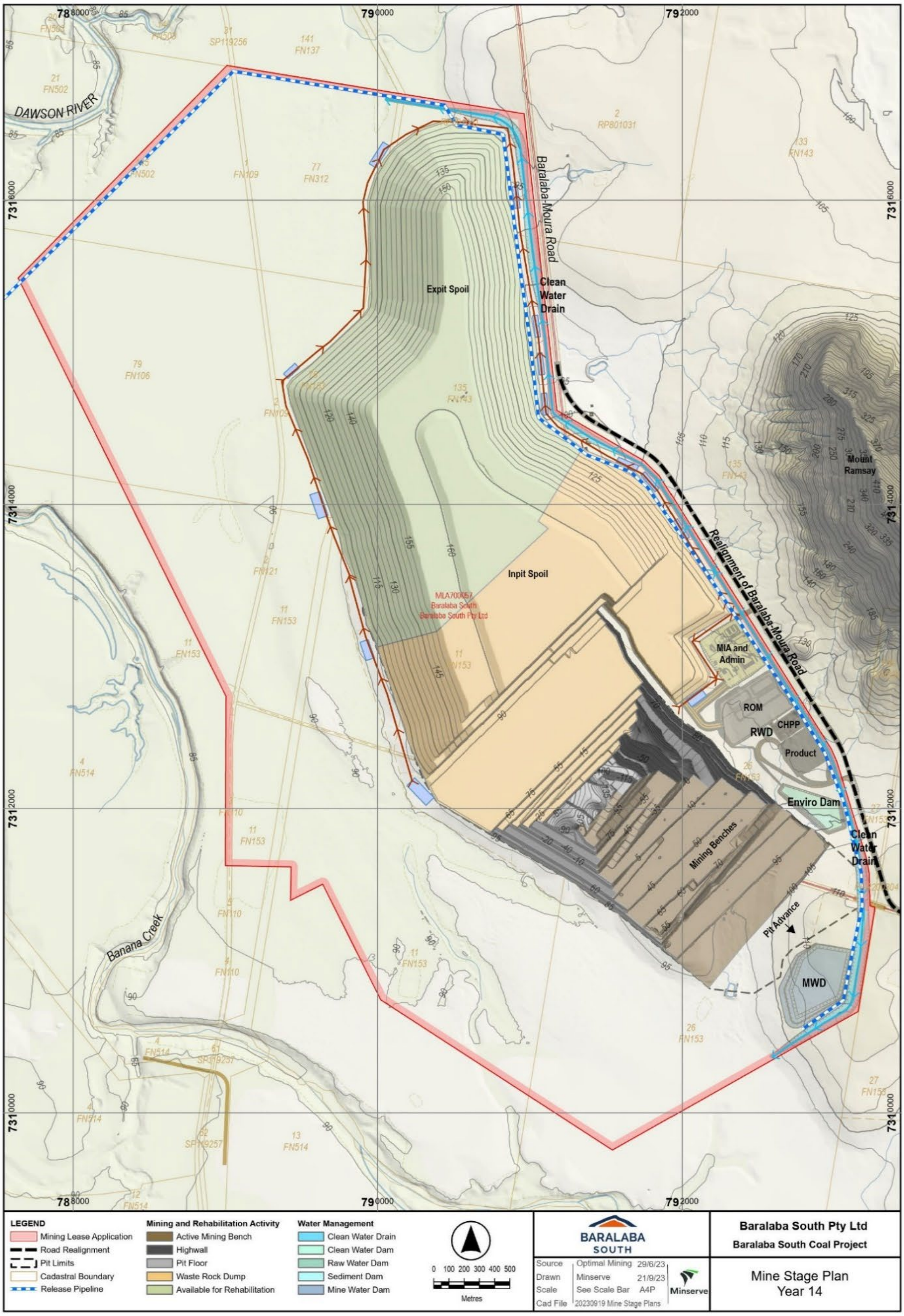


Figure 3.7: Mine stage plan—year 14

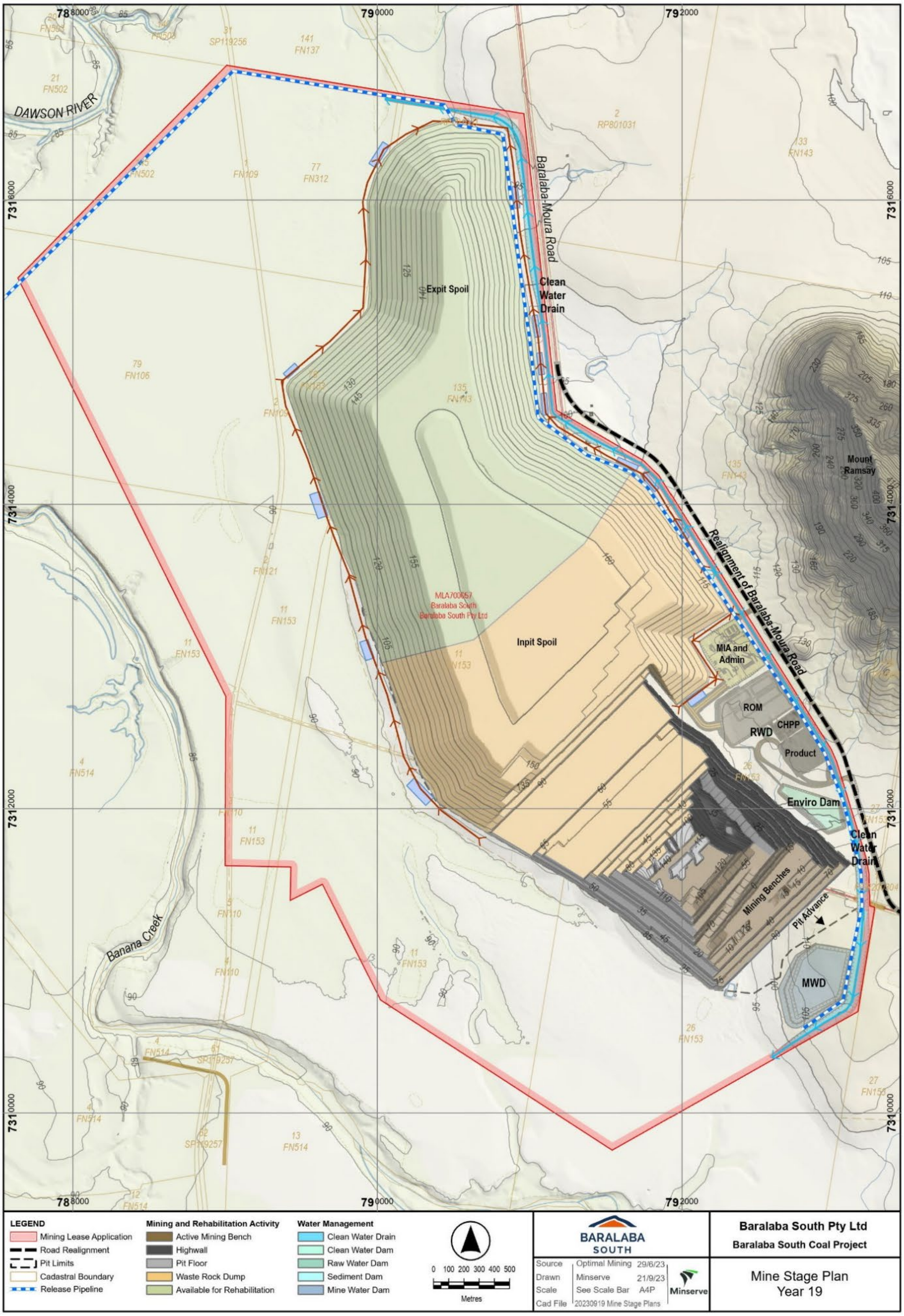


Figure 3.8: Mine stage plan—year 19

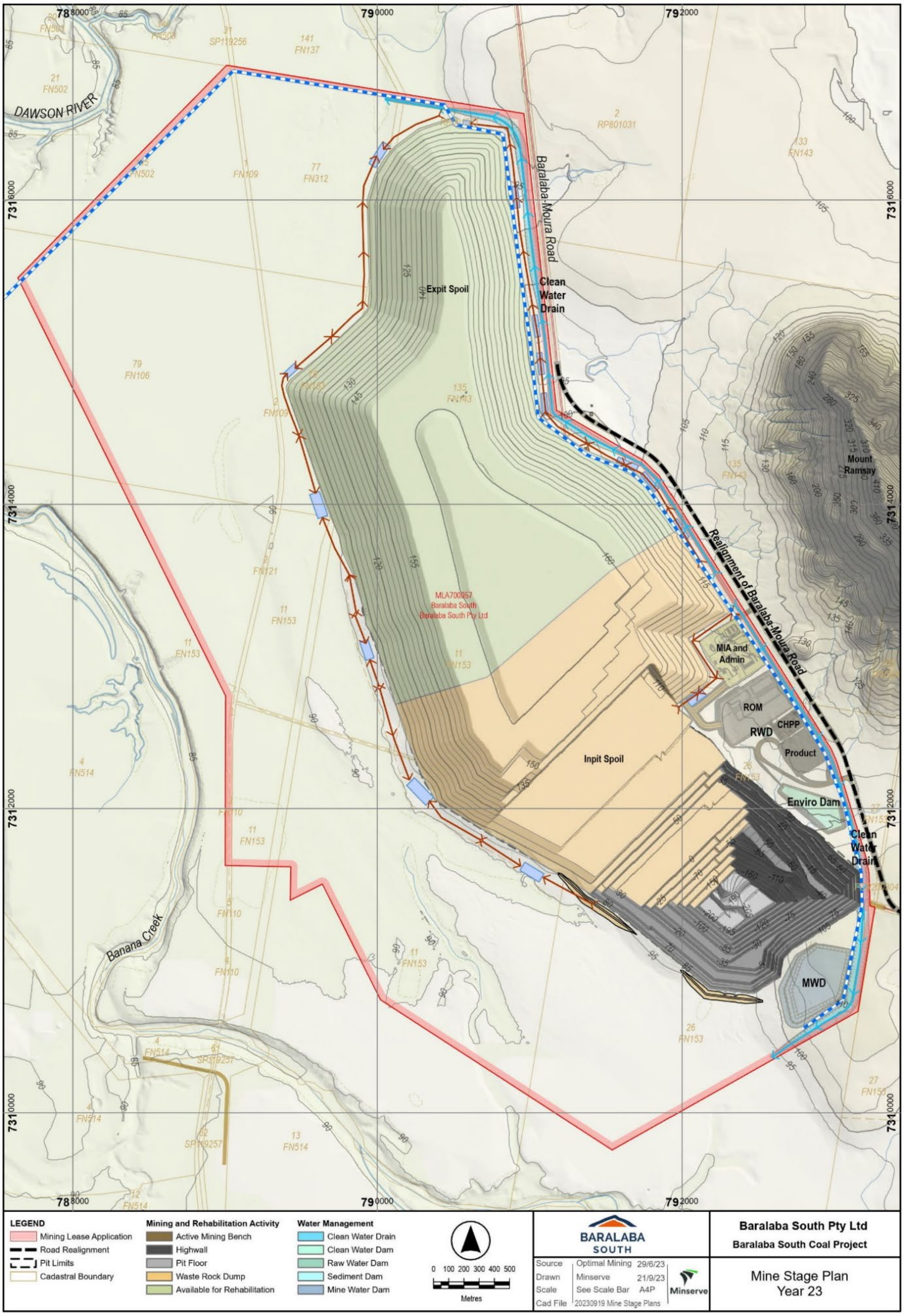


Figure 3.9: Mine stage plan – year 23

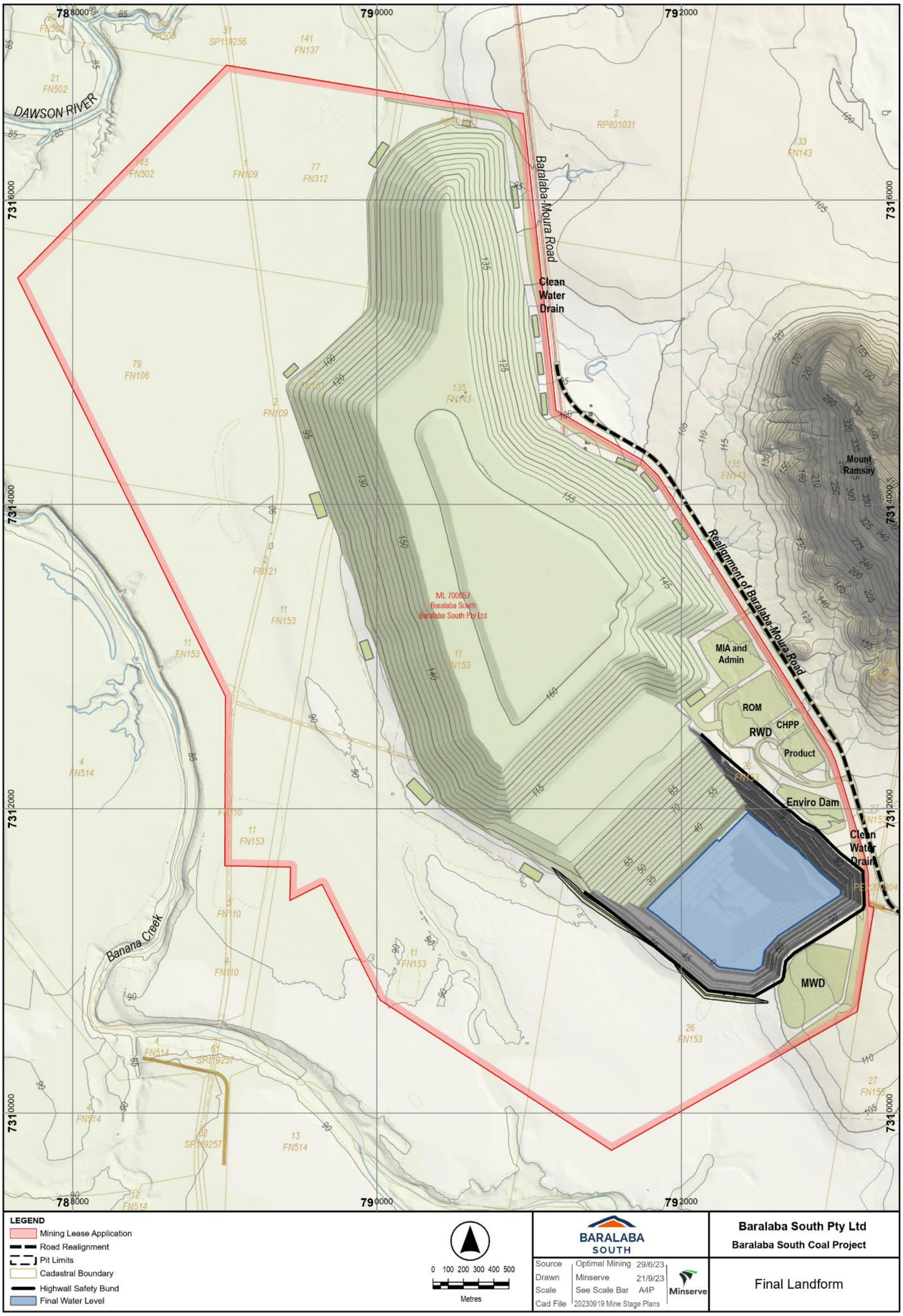


Figure 3.10: Proposed final landform

Figure 3.11: Final landform 3D visualisation, looking south, if MIA pad retained

3.4.2 Waste rock emplacements

A single WRE adjacent to the mining pit, with elevations of up to 60 m above the existing surface and typical slopes of less than or equal to 9˚, will be required to provide sufficient working space for operations to commence. Overall slope lengths are typically less than 470 m with contour banks installed to improve landform stability. Slopes in between contour banks are not expected to exceed approximately 235 m. As operations progress, spoil will be progressively placed in-pit, commencing from the northern end of the pit and progressing to the south. The locations of the WREs are indicated at Figure 3.10.

The in-pit WRE has been designed to maximise usable area and is comprised of relatively level areas and occasional short, stepped slopes of up to 10°.

The detailed landform design will be similar to that utilised for Baralaba Central Mine, incorporating the following components:

- maximum slope gradient of approximately 9° for elevated landforms;
- installation of contour banks at a maximum of 235 m intervals to reduce the slope length; and
- terraced profiles to reduce the requirement for contour banks and engineered drains.

As identified in section 3.2.2, waste rock is expected to be overwhelmingly NAF with excess acid neutralising capacity and, therefore, poses a negligible risk of developing acid conditions and a consequent negligible risk of impact on water quality. Additionally, spoil is expected to generate low-salinity surface runoff and seepage with low soluble metal/metalloid concentrations. There is a risk that some waste rock materials will be sodic indicating a potential for dispersion and erosion. Where any highly sodic and/or dispersive spoil is identified, this will be directed to WRE locations to ensure burial at depth. It is expected that standard rehabilitation methods will be appropriate to effect a safe and stable landform for the slope designs proposed.

Given the low geochemical risk associated with waste rock materials and resulting low risk arising from any seepage through the structure, the top surfaces of the out-of-pit WRE are proposed to be internally drained with occasional clay-lined water storages constructed in areas proposed for a grazing PMLU. This will reduce the total volume of stormwater runoff draining via rehabilitated slopes. Surface drainage from long regraded rehabilitation slopes is intended to be managed with the limited use of graded banks by principally targeting sufficient surface roughness through contour cultivation and good revegetation rates. However, this approach will ultimately depend on the results of further spoil testing, final rehabilitated slope angles and the outcomes of early rehabilitation works. If erosion is observed in early rehabilitation efforts, contour banks and spine drains will be incorporated into the rehabilitation design as a temporary erosion control measure.

Progressive rehabilitation of WREs will be carried out when final spoil placement has been attained and areas are no longer required for mining operations. At this point, areas will be classified as ‘available for rehabilitation’, and the sequence of rehabilitation activities as described in section 3.5 will commence. Ongoing monitoring of climate, geotechnical properties of materials, revegetation progress and surface water runoff quality throughout all rehabilitation phases will provide systematic feedback for assessment of the rehabilitation measures to be used.

While topsoil resources have been characterised as generally being of reasonable quality for rehabilitation works, the total availability of topsoil limits respreading depths to about 0.2 m, which is comparable to natural topsoil depths in the area and is considered acceptable. Surface preparation of rehabilitated and topsoiled slopes will be critical to address potential surface erosional risks and ensure successful revegetation occurs.

A final landform bund is proposed around the south-western corner of the final void and an earthen embankment adjacent. The bund and embankment will be constructed using non-dispersive, low permeable engineered fill from the box pit. A preliminary crest level of 98 mAHD and is based on the maximum PMF level and includes a freeboard allowance and a sensitivity allowance. As the earthen embankment and final landform bund is to be retained for the post-mining phase the flood impacts identified for the operational phase are the same as for the post-mining phase. The proposed post-mining landform (Figure 3.10) was modelled as part of the ‘mine developed case’ described in Appendix C, Flood Impact Assessment, and shows the PMF limits (refer Appendix A, Surface Water Impact Assessment, and the mine developed case flood maps included as Appendix C, Flood Impact Assessment).

3.4.3 Tailings and reject management

A total of nearly 14 Mt (ROM) of reject material will be generated over the life of the mine—this is equivalent to less than 1% of the total amount of the mineral wastes to be managed by weight. Rejects will comprise coarse and fine rejects and dewatered fines all reporting to a rejects stockpile for inclusion in waste rock emplacements. No separate tailings disposal facility is proposed for the Project.

Up to 40% of coal reject materials may have some, albeit low, degree of risk associated with potential acid generation. Given the comparatively small volume of material and method of burial within spoil piles, coal reject is regarded as posing a low risk of environmental harm (refer section 3.2.2). For this material, the low sulphur (and sulphide) concentrations, as well as the low metals/metalloids concentrations, suggest that the magnitude of any localised acid, saline or metalliferous drainage, if it occurs at all, is likely to be small and confined to the pit area (or out-of-pit emplacement area during the early years of mining).

Therefore, when placed within the alkaline NAF spoil, emplaced coal reject poses a very low risk of causing environmental harm. Prior to about year five, when in-pit spoil placement is projected to commence, additional care will be taken to identify and manage any higher risk rejects to ensure disposal occurs within in-pit emplacements.

The decommissioning, closure and post-closure aspects of the partially backfilled pit (and subsequent final void) will be addressed by the PRC Plan. However, as coal rejects will be covered by a minimum of 5 m final thickness of spoil and will not be proximate to the final landform surface, the proposed management of coal reject is not expected to create an environmental risk at closure.

3.4.4 Final void

The mine planning progression for the Project will result in the southern extents of the mining pit remaining as a final void. Highwall slope design for the Project is limited by the interaction of undercutting shears and faults in the underlying geology (Cartledge, 2023). A kinematic and slope stability analysis was undertaken for the Project and the following design recommendations proposed:

- 30m bench height;
- 65° bench angle; and
- 15m wide berms.

The surface area of the final void has been minimised as far as practical, while maximising the area capable of being rehabilitated to a grazing landscape. A conceptual analysis of blasting and reshaping the highwall was undertaken which indicated that reshaping of the highwall to a slope gradient of approximately 25% would result in a 14% loss of grazing productivity, future resource and an increase in-pit lake surface area.

It is noted that geotechnical investigations will be refined during the mining phase based on operational experience and collated data, current advice for the final void is that overall slope gradients at closure should be at approximately 40° and 32° for highwalls and low walls respectively (Cartledge, 2023). The final residual void design will adopt recommendations to ensure that it remains geotechnically stable following closure. The proposed final void design parameters are outlined in Table 3.2.

Upon completion of final void earthworks in a given area, a survey will be undertaken by an AQP to confirm that the area has been shaped in accordance with completion criteria.

The final void will be left in a geotechnically stable condition. A final landform bund will be constructed along the crest of the final void to prevent vehicular access. Fencing may also be used to restrict further access to the final void by unauthorised people, wildlife and/or stock.

Proposed PMLU options for the final void are discussed in section 3.3

Table 3.2: Projected final void physical parameters

Feature	Approximate footprint area (ha)	Approximate depth (m AHD)	Overall maximum slope (degrees)	Approximate overall maximum slope length (m)
Post-mining landform below pre-existing natural topography (low wall)	46.4[2]	<100	40°	340
Highwall	37[1]	30-90[2]	32°	340
Void Floor	7	-205	n/a	n/a
Anticipated pit lake[1]	89	32	n/a	n/a

[1] at equilibrium
[2] to pit lake equilibrium water level.

Slope design for the Project has been informed by a geotechnical pre-feasibility study which recommended that during operations, design parameters should not exceed 45° slope, 15 m bench height, and a 5 m berm for alluvium, and a 50° slope, 20 m bench height and 10 m berm for weathered Permian slopes. Highwall slope design is limited by undercutting shears and faults in the geology and, for stability, operational benches will not exceed an overall angle of 40° (Cartledge, 2023). The slopes developed for the final design are less than those recommended for stability during operations and are consistent with the design criteria utilised at Baralaba Central Mine which has a similar geology. A small proportion of the final landform for Project is located on the eastern floodplain of the Dawson River (Figure 3.12). Waste rock placement in the first year of mining will provide PMF flood protection to mine operations. The final landform bund located adjacent the final void will be constructed by year 19 and will provide PMF flood protection to the final void in the final landform.

The catchment area of the final void will be defined by the surrounding landform. The final landform will result in a 0.02% reduction of catchment to the Dawson River at the Beckers gauging station. The loss of catchment will not result in a substantial reduction in flow in the river, and will not impact on compliance with the Environmental Flow Objectives for the river (Appendix A, Surface Water Impact Assessment). It is predicted that the final landform will not impact the timing of flows at Beckers gauging station.

Modelling indicates that there is negligible reduction in mean annual flow 0.045% adjacent to the Project area, this value decreasing with increasing distance downstream. This is not expected to result in impacts to the existing Dawson River channel morphology or riparian vegetation. There will be no discernible impact to the aquatic ecosystem of the Dawson River.

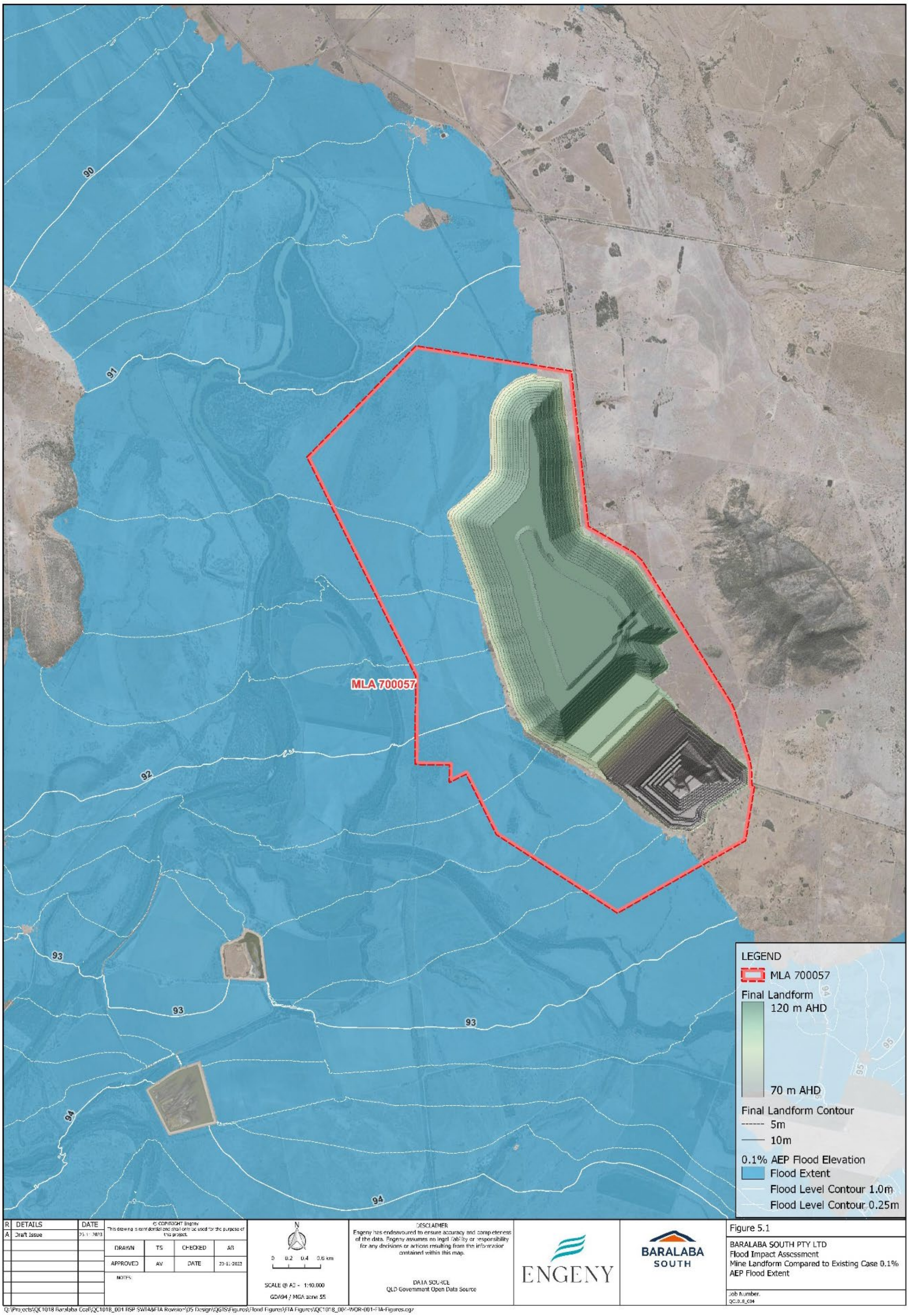


Figure 3.12: 0.1% AEP flood extent and the mine developed case

A final void hydrology model was developed by Engeny (Appendix A, Surface Water Impact Assessment) considering final void inflows (catchment runoff, direct rainfall, and groundwater) and outflows (evaporation). Final void water behaviour (final void water level and salinity) has been modelled as part of the Surface Water Impact Assessment (Appendix A, Surface Water Impact Assessment) for a 500-year forecast using the final void water balance model for a 'base case' scenario and a 'clean catchment inflow' scenario. The 'base case' scenario includes the final landform catchment area of approximately 220 ha, while for the 'water mitigation scenario', the catchment area has been increased to approximately 720 ha to account for the rehabilitated final landform and north-east catchment diversions to the final void (Figure 3.13).

The model results indicate that:

- For the water mitigation scenario, the final void water level is expected to approach an equilibrium level of 32 m AHD after approximately 325 years.
- For the base case scenario, the final void water level is anticipated to approach an equilibrium level of 52 m AHD after approximately 200 years.
- The final landform design indicates a pit crest level of 93 m AHD giving the pit a freeboard allowance of 55.6 m. This indicates that the pit is not at risk of overtopping to the receiving environment, as the sequence of rainfall events required to overcome the freeboard allowance is extremely unlikely.
- Continued accumulation of salt is expected to occur as a result of runoff and groundwater ingress combined with evaporative concentration. The final void assessment assumed a constant salt load to the void. This is a conservative estimate, as modelling does not include the decay rate associated with the amount of salt likely to report to the pit areas over time.
- In the proposed final void arrangement, there are no salt outflows, and therefore, modelling indicates pit lake water quality remaining brackish (5,650 mg/L TDS) in the clean catchment scenario 500 years from cessation of mining under the clean catchment inflow scenario.
- Under all climate change scenarios, the pit lake level is more than 64 m below the pit crest and will remain as a groundwater sink. The associated risk of contaminant release and environmental harm is insignificant.

Under all climate change scenarios using the 2090 projections, salinity within the void is predicted to increase due to increased evaporation rates.

3.4.5 Mine infrastructure areas

The major infrastructure facilities proposed at the Project site include:

- CHPP;
- ROM and product coal stockpiles;
- fuel storage and fuelling area;
- vehicle/equipment washdown area;
- workshops, stores and office area;
- consumables, tyre and capital spares storage;
- heavy vehicle park up;
- light vehicle parking areas;
- water release/extraction infrastructure;
- truck load out facility; and
- haul roads, internal roads and access tracks.

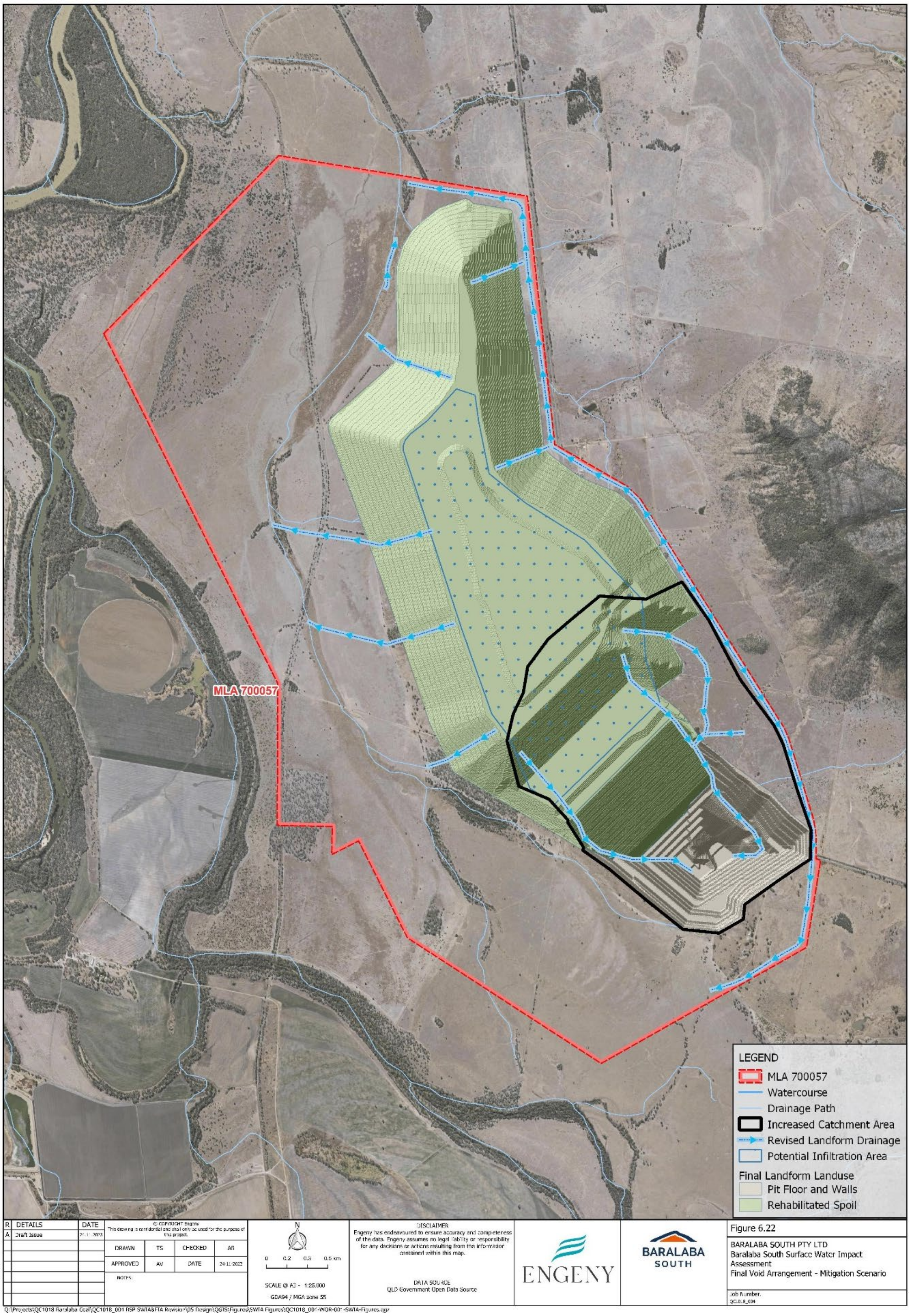


Figure 3.13: *Final landform catchment*

Mine infrastructure areas will be rehabilitated once mining operations have ceased. At closure, it is anticipated that the majority of mine infrastructure will be decommissioned, with plant, equipment and infrastructure either sold or dismantled and removed. Plant and equipment footings will be excavated to a depth of at least 1 m below ground level. Following decommissioning and removal, disturbed infrastructure areas will be recontoured to the approximate pre-mining landform and revegetated.

At closure, consultation with the underlying landowner will identify any roads or tracks and other infrastructure having a beneficial use that, subject to Ministerial approval under the MR Act, should be retained. Otherwise, all road furniture and fittings will be removed for recycling or disposal. Roads, carparks and hardstands will be removed, reprofiled, topsoiled and seeded. Any compacted areas underneath haul roads will be deep ripped. Other infrastructure may remain depending upon the PMLU adopted or where consultation with underlying landowners identifies any infrastructure of value to the PMLU. For any roads or infrastructure to be retained, a written agreement will be entered into with the underlying landowner that transfers liability for the structure and its use to the landowner.

Appropriate erosion control measures will be designed to ensure controls exist for surface runoff from disturbed areas. Any land identified to be contaminated will be subject to administering authority notification, where required. A site investigation will be completed, then contaminated material either removed to a licensed facility, or alternatively risk assessed and listed on the environmental management register to the extent necessary. Hazardous materials will be removed from site, equipment de-gassed, de-oiled and de-pressurised in accordance with legislative requirements.

Once reshaped, infrastructure areas will be rehabilitated as required, for example, by topsoiling and revegetating as described in section 3.5.2 and section 3.5.3. As previously identified, the majority of the mine infrastructure area is expected to be returned to a grazing PMLU.

The land disturbance and other controls detailed at section 10.5 of Chapter 10, Land and Visual Amenity, will be implemented as appropriate. In addition, controls aimed to address specific demolition and closure risks will be implemented.

3.4.6 Water management infrastructure

All water infrastructure (sediment dams, tailings storage facilities, mine affected water dams, clean water dams and supporting pipelines and pumps) will be decommissioned, unless otherwise agreed with the underlying landholder and Ministerial consent is obtained under the MR Act. Water infrastructure will be dewatered, and sediment and embankments removed. Rehabilitation and treatment of water infrastructure will vary depending on the extent of disturbance or contamination present from mining activities in conjunction with the desired outcome (e.g., retain or remove).

Environmental dams will be backfilled and seeded with a pasture seed mix suitable for grazing. Raw water dams, once no longer required, will be emptied by pumping to the final void. Where installed, dam liners will be removed and appropriately disposed of, and any contaminated soils will be treated and/or removed where necessary. Dams will be reprofiled and revegetated with a pasture seed mix suitable for grazing.

The diversion drains located to the east and the west of the Project are to remain post-mining. A key objective of the revegetation of diversion drains will be to develop self-sustaining vegetation communities.

3.4.7 Contaminated land assessment

Where required, a contaminated land assessment will be undertaken by an appropriately qualified person confirming the land does not present an unacceptable risk to proposed future land uses or the environment. Any identified contaminated material incompatible with the proposed PMLU will be either treated in situ or on-site, confined by burial, or removed, transported to an approved landfill for disposal or alternatively risk assessed and listed on the environmental management register to the extent necessary.

3.4.8 Final landform stability

Landform stability is achieved by utilising an appropriate slope length and angle, suitable material selection to support the PMLU and early establishment of ground cover for erosion mitigation. The final landform is expected to be stable and suitable for the proposed PMLUs of improved pasture for grazing and natural ecosystem.

An erosion analysis using the Watershed Erosion Prediction Project (WEPP) was undertaken for the waste rock emplacements to inform final landform stability. WEPP modelling considers four key data points: climate information, soil profile, land use management and slope design. Climate parameters were modelled from the area using CLIGEN 5.3, with input data sourced from SILO (daily rainfall, maximum and minimum temperature, solar radiation, and maximum relative humidity) at coordinates 149.85, -24.25; alongside on-site weather station (rainfall intensity) data. The following three SMUs comprising the majority of recoverable topsoil resources (refer section 3.2.3) were assessed:

- Langley SMU;
- Greycliffe SMU; and
- Thalberg SMU.

Six soil samples from the key SMUs were selected for analysis based on the detailed compositional analysis provided in Table 22 of the Soils and Land Assessment (Appendix K) along with those which failed the SCL site criteria as per Table 8 of Appendix K: Soils and Land Assessment and therefore represent worst case scenarios. The following samples were selected for analysis:

- Langley Sample 114;
- Langley Sample 132;
- Langley Sample 139;
- Greycliffe Sample 175;
- Thalberg 158; and
- Thalberg 150.

In creating the land use management parameters for WEPP modelling, cover classes were established at 5% intervals ranging from 0% to 100%. Vegetation cover was fixed at these percentages throughout the WEPP simulations, such that consistent cover was maintained across the 100-year simulation period without growth or decay.

Slope design specifications used in the analysis were sourced from the proposed final landform design, as shown in Figure 3.14. The slope selected for analysis represents the maximum slope design in the final landform, where the top of the slope is approximately 159 mAHD, the bottom of the slope approximately 89 mAHD, equating to a vertical height of 70 m. The slope is a continuous decline over approximately 470 m, resulting in an approximate slope gradient of 1:7 (15%).

Initial WEPP analysis identified that 90% vegetation cover would be required to achieve a tolerable erosion rate of 10 t/ha/yr (Figure 3.15). As a result, additional analyses were undertaken to simulate the use of contour banks along the slope, reducing the overall slope length by 50% and 25%, equivalent to slope lengths of 117 m and 234 m respectively.

Figure 3.14: WEPP analysis, modelled slope location

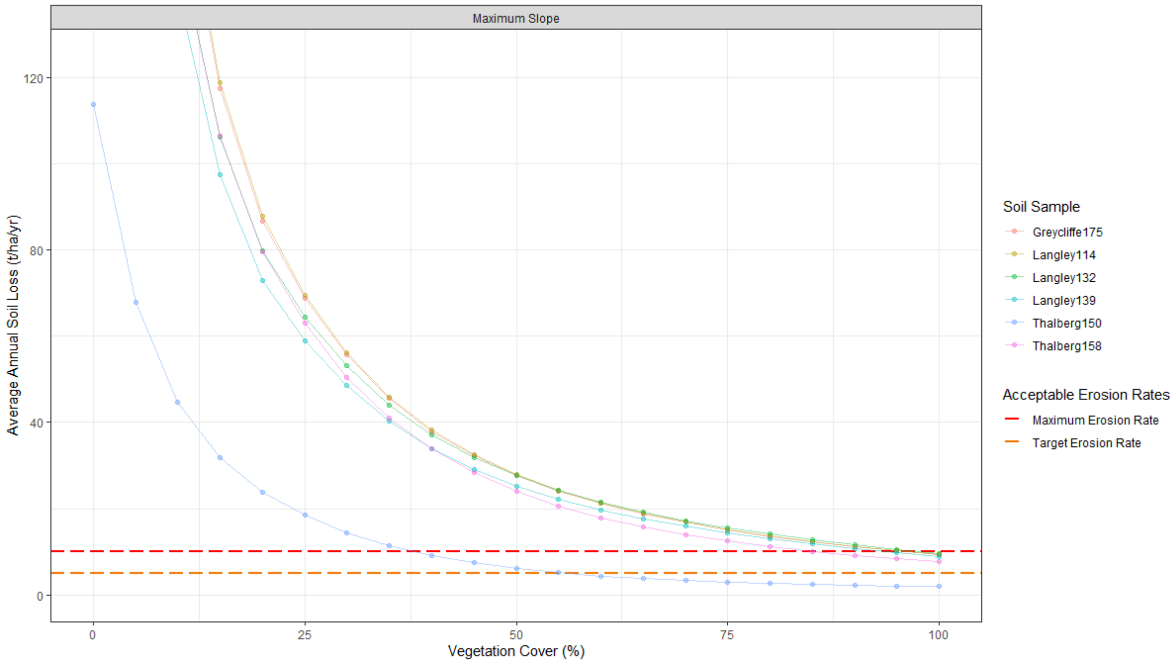


Figure 3.15: Average annual soil loss (t/ha/yr) and vegetation cover, maximum slope

882 100-year WEPP iterations were run, covering the range of soil samples and land use management profiles identified above. To determine the worst case, maximum potential erosivity of the slope, the average annual soil loss, expressed in tonnes per hectare per year, for each iteration was calculated and assessed against a target and maximum erosion rate. For mining rehabilitation, a maximum tolerable erosion rate of 10 t/ha/yr is generally considered acceptable (Lu 2001) and was adopted for this analysis. The results of the analysis are shown in Figure 3.15, Figure 3.16 and Figure 3.17.

Target erosion rates of less than 10 t/ha/yr can be achieved at the following minimum ground cover percentages under the conditions indicated:

- 75% vegetation cover is required for a slope length of 234 m (50% of the maximum slope length) (Figure 3.16); and
- 60% vegetation cover for slopes of 117 m (25% of the maximum slope length) (Figure 3.17).

Results of the WEPP analysis indicate that long-term erosional stability can be achieved when utilising contour banks to minimise slope length coupled with a vegetation cover of greater than 60%, considered to be a conservative outcome.

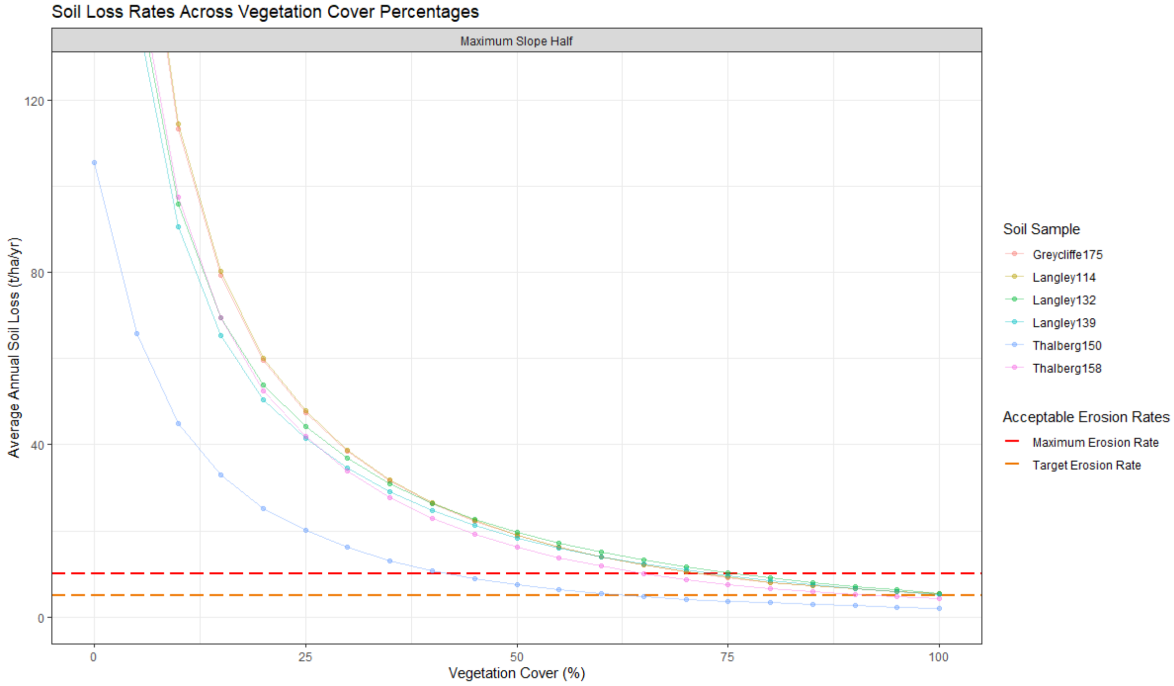


Figure 3.16: Average annual soil loss rates (t/ha/year) with vegetation cover, 234 m slope

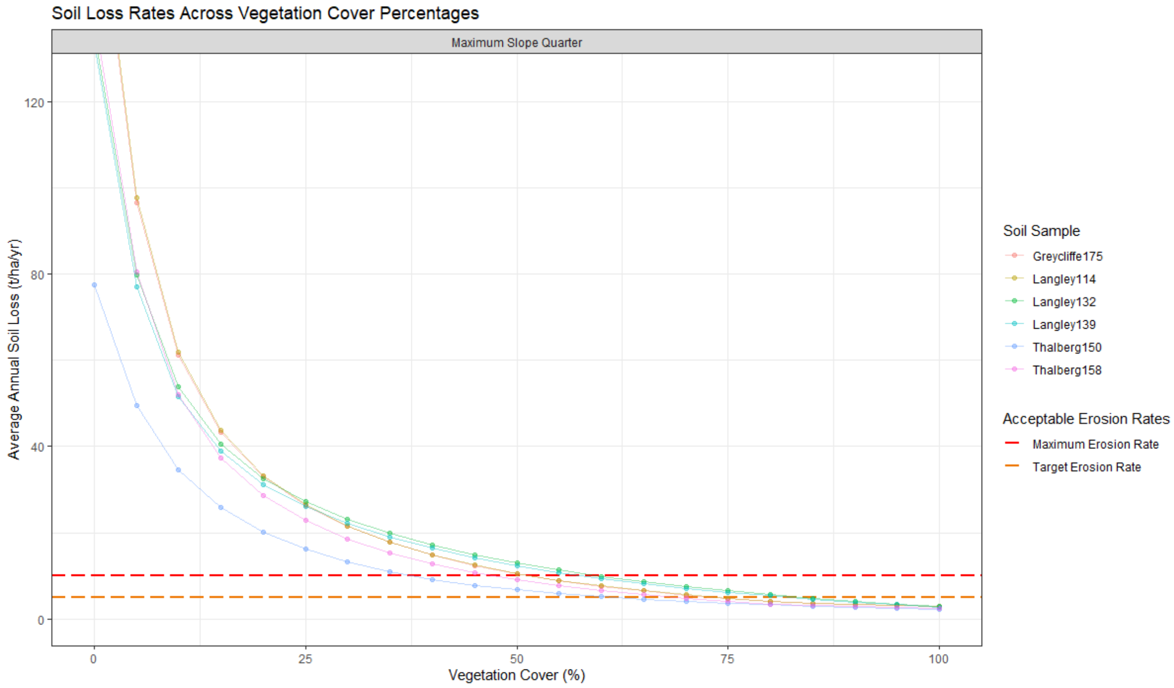


Figure 3.17: Average annual soil loss rates (t/ha/year) with vegetation cover, 117 m slope

3.4.9 Rehabilitation areas

To demonstrate that the Project will meet current legislative requirements, a draft PRC Plan has been prepared for PMLU alternative 1, being an improved pasture for grazing with a pit lake and highwall 'natural' ecosystem. PMLU alternative 1 is considered the most desirable outcome, aligning with community values, local planning instruments and with regard to the rehabilitation hierarchy outlined in 'Rehabilitation requirements for mining resource activities' (DES 2018).

To allow for the development of a PRC Plan schedule that satisfies the requirements of the PRC Plan Guideline, discrete rehabilitation areas (RAs) have been defined. An RA is defined in the Environmental Protection Regulation 2019 as an area of land to which a rehabilitation milestone for the PMLU relates. The RAs for the Project have been nominated for defined areas of disturbance having either or both different rehabilitation or PMLU requirements; RAs are shown in Figure 3.18 and outlined in Table 3.3.

Table 3.3: Rehabilitation areas for the Project

Rehabilitation area reference	Rehabilitation area	Description	PMLU
RA1	In-pit and out-of-pit waste rock emplacements, earthen embankments and final landform bund	• Open cut disturbance including in-pit and out-of-pit waste rock emplacement including the portion of the haul road located within the waste rock footprint and earthen embankment that will be incorporated into the final landform. • Final landform bund	Improved grazing pasture – low intensity cattle grazing
RA2a	Final Void: Highwall	• Highwall of the final void remaining from open cut disturbance after reshaping to the final landform.	Highwall 'natural' ecosystem - Habitat and ecosystem services
RA2b	Final void: Pit lake	• Water containment area at equilibrium, portion of regraded low wall adjacent the water containment area	Pit lake -- Habitat and ecosystem services
RA3	Water management infrastructure - decommissioned	• Mine water dams, raw water dams, sediment dams rehabilitated to pasture • Diversion drains • Off lease water release/extraction infrastructure	Improved grazing pasture – low intensity cattle grazing
RA4	Mine infrastructure areas	• Mine infrastructure area • Internal access roads including haul roads on natural ground	Improved grazing pasture – low intensity cattle grazing
RA5	Other minor disturbance	• Disturbance associated with topsoil stockpiles on natural ground • Minor disturbance from other approved disturbance activities resulting in compacted land requiring rehabilitation	Improved grazing pasture – low intensity cattle grazing
RA6	Drainage channel	• Drainage channel to maintain water flow for fish passage for Tributary 8 an unnamed waterway that traverses the MLA	Permanent drainage channel
RA7	Retained infrastructure[1]	• Retained infrastructure consistent with surrounding PMLUs, for which landholder agreement is in place	Retained infrastructure

1. Currently there are no landholder agreements for retained infrastructure. The RA has been developed to cover retained dams, diversion drains, roads and buildings within the MIA, as it is anticipated future landholders may request to retain these structures

Figure 3.18: Rehabilitation areas

3.4.10 Progressive rehabilitation and rehabilitation schedule

Indicative mine stage plans have been prepared for years 1, 6, 11, 14, and 19 (refer Figure 3.3 to Figure 3.8), as well as a post-mining landform stage representing rehabilitation status at notionally two years after completion of mining (Figure 3.10). The stage plans also indicate the conceptual sequence of mining and rehabilitation activities for each mine stage year by showing:

- areas of waste rock emplacement activity;
- areas available for rehabilitation;
- areas reshaped and topsoiled; and
- areas considered to be rehabilitated (notionally one year post-revegetation).

For an open cut coal mining operation, once areas become available for rehabilitation, the rehabilitation activities outlined in the following sections can usually progress on a relatively well-defined schedule, subject to seasonal conditions and whether a sufficient area is available in a given season to warrant the mobilisation of resources required to undertake rehabilitation works. Typically, the required sequence of rehabilitation activities is expected to commence within 12 months of areas becoming available for rehabilitation.

The respective areas of each rehabilitation milestone point shown in the mine stage plan figures have been integrated into the development of rehabilitation stage plans and a rehabilitation schedule. A summary of the rehabilitation schedule is presented in Table 3.4 and rehabilitation stage plans are shown in Figure 3.19 - Figure 3.25. The full rehabilitation schedule for each rehabilitation area and milestone are provided in Appendix AA, Draft Progressive Rehabilitation and Closure Plan as per the requirements of the PRC Plan schedule native Excel template.

Table 3.4: Indicative progressive rehabilitation by mine stage plan year

Mine stage	Rehabilitation area	Area available for rehabilitation[1] (ha)	Area reshaped and topsoiled[2] (ha)	Area revegetated[2] (ha)	Area rehabilitated to final PMLU[2] (ha)
Year 6	RA1	158			
Year 11	RA1	180	158	158	
Year 14	RA1	55	339	158	
Year 19	RA1	47	393	339	
Year 23	RA1	62	440	339	158
Post-mining (Year 24-45)	RA1	796.5	796.5	796.5	796.5
	RA2a	35.6	35.6	35.6	35.6
	RA2b	111.4	111.4	111.4	111.4
	RA3	79.9	79.9	79.9	79.9
	RA4	39.6	39.6	39.6	39.6
	RA5	150.5	150.5	150.5	150.5
	RA6	0.4	0.4	0.4	0.4

[1] areas shown represent the actual area at that point in time.
[2] areas shown represent the cumulative total of rehabilitation.

The SIA identified concerns by a number of community members expressing concerns that the Project would avoid the new legislative requirement of developing a PRC Plan. As outlined in section 3.1, a key component of the EP Act (section 125 (1)(n)) is the requirement for a site-specific application for a mining activity relating to a mining lease to be accompanied by a proposed PRC Plan that includes a PRC Plan schedule providing rehabilitation milestones for each proposed PMLU and management milestones for each NUMA proposed. A draft PRCP schedule has been developed for the Project and is provided in Appendix AA, Draft Progressive Rehabilitation and Closure Plan.

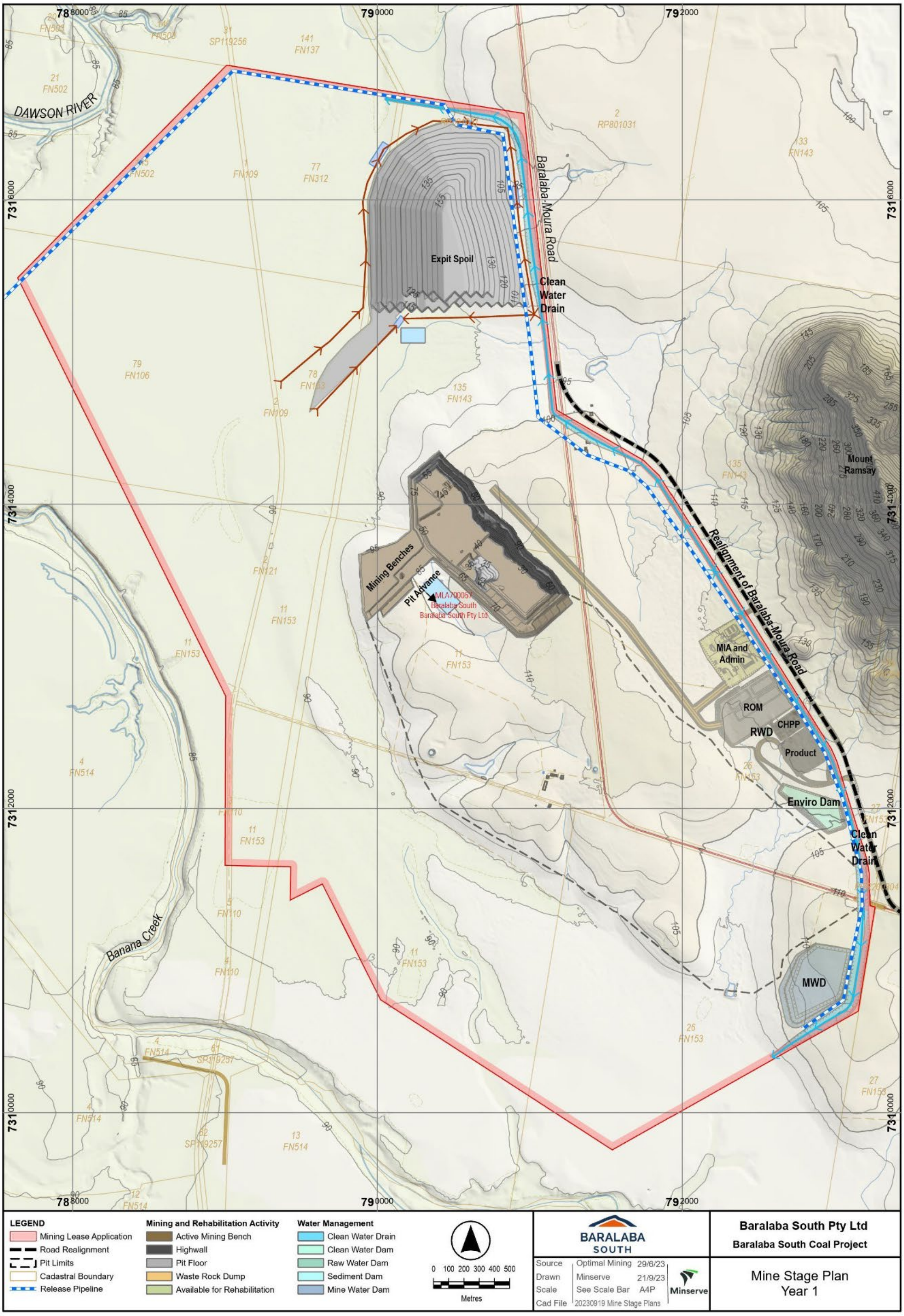


Figure 3.19: Rehabilitation schedule plan—Year 1 mine plan

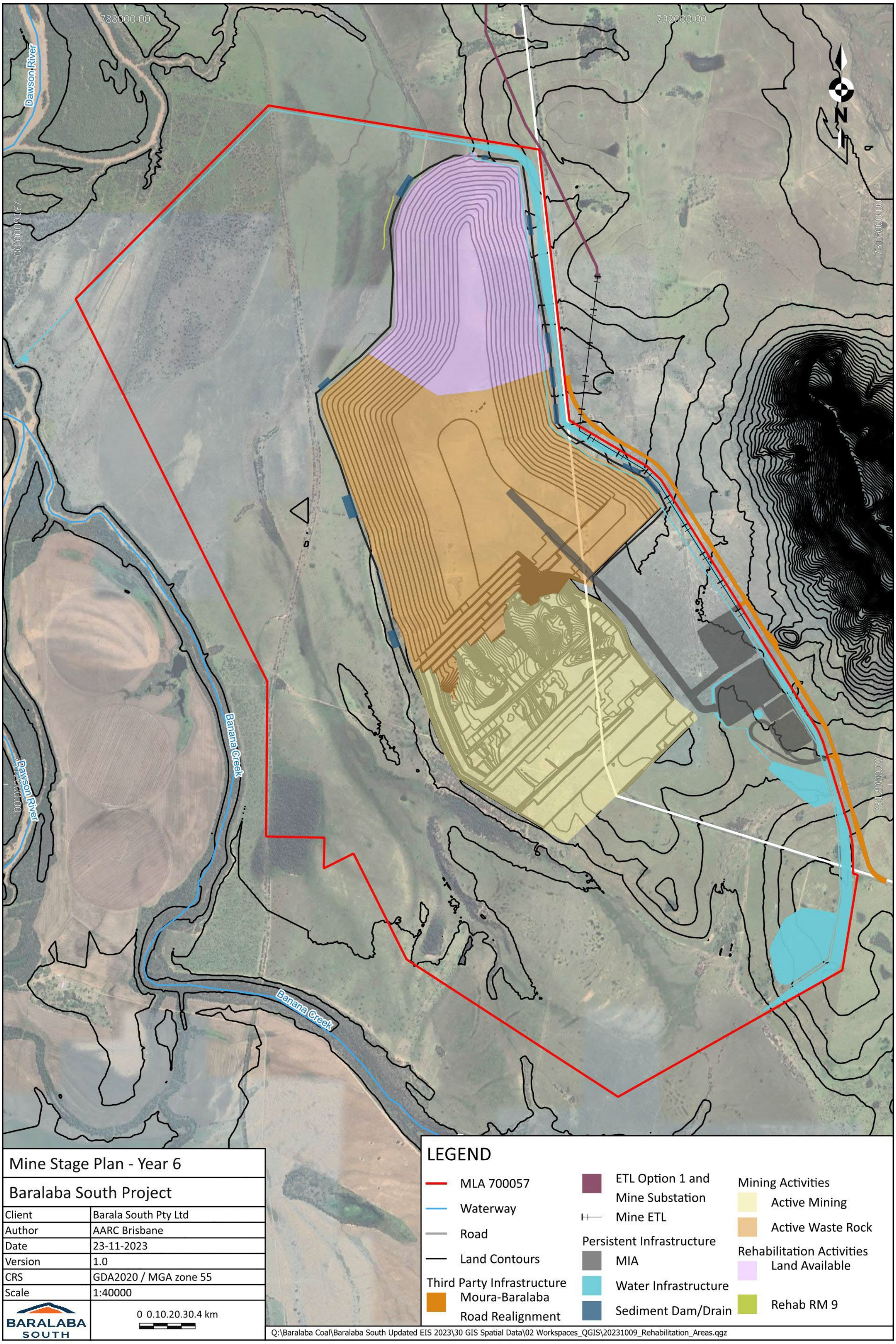


Figure 3.20: Rehabilitation schedule plan—Year 6 mine plan

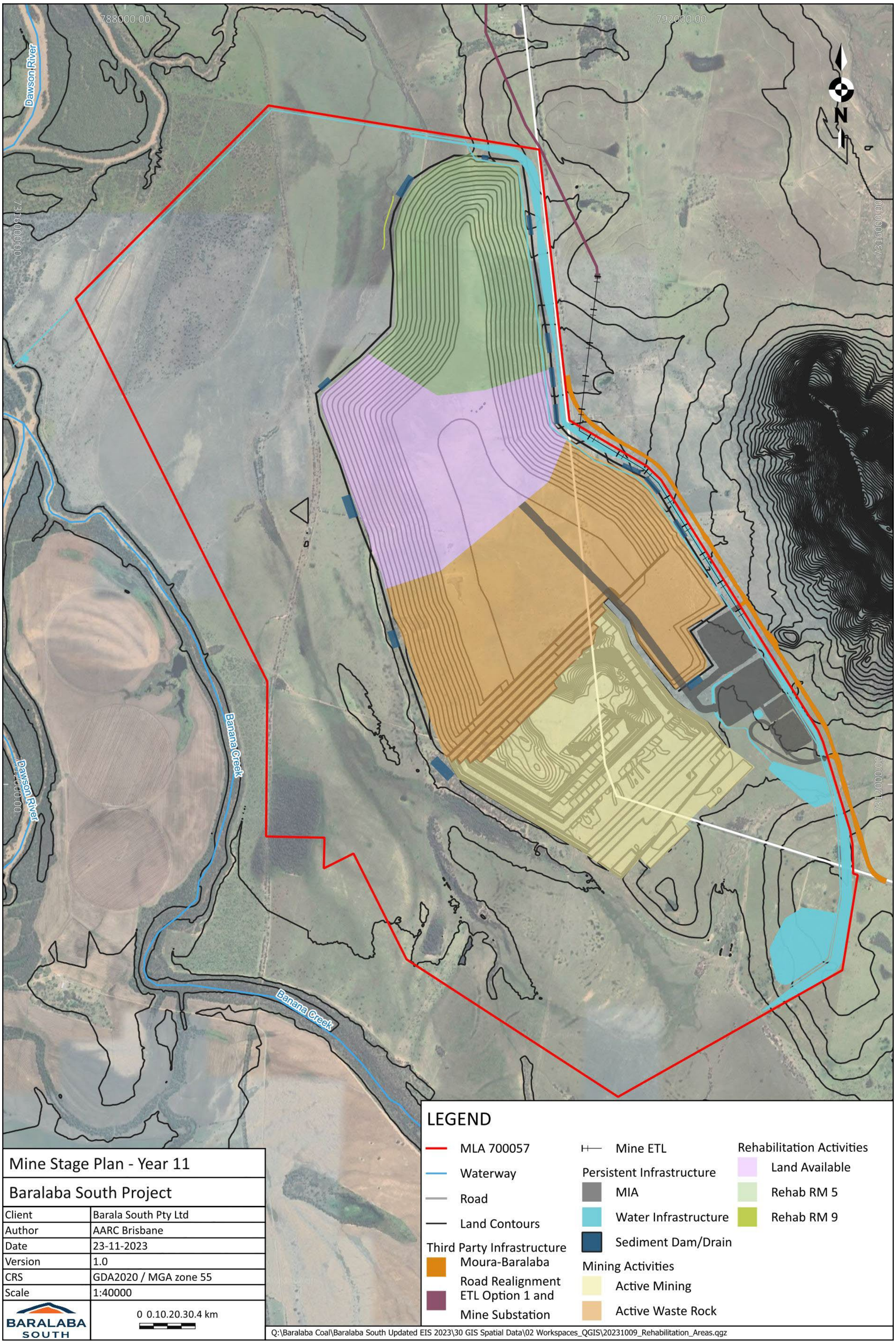


Figure 3.21: Rehabilitation schedule plan—Year 11 mine plan

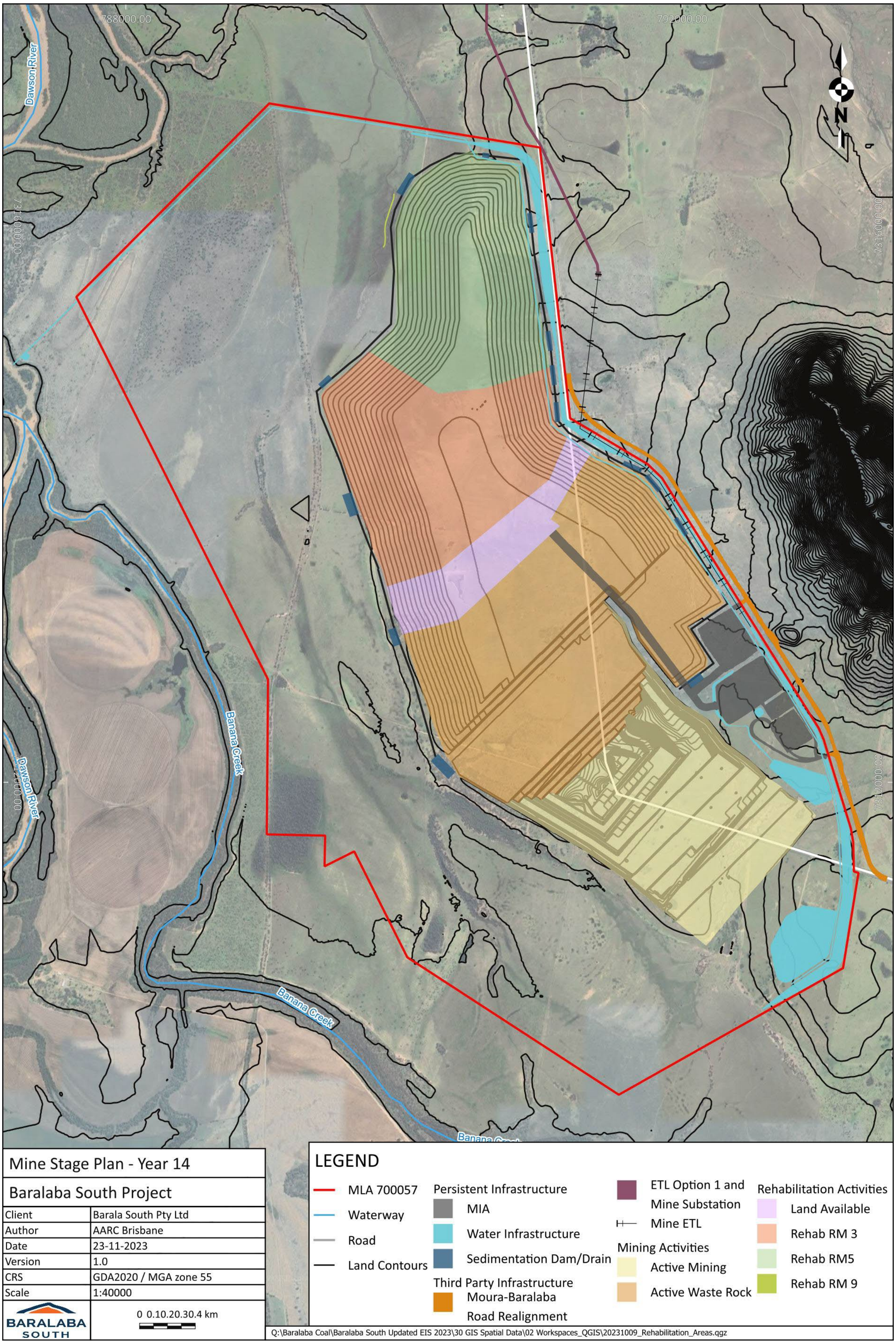


Figure 3.22: Rehabilitation schedule plan—Year 14 mine plan

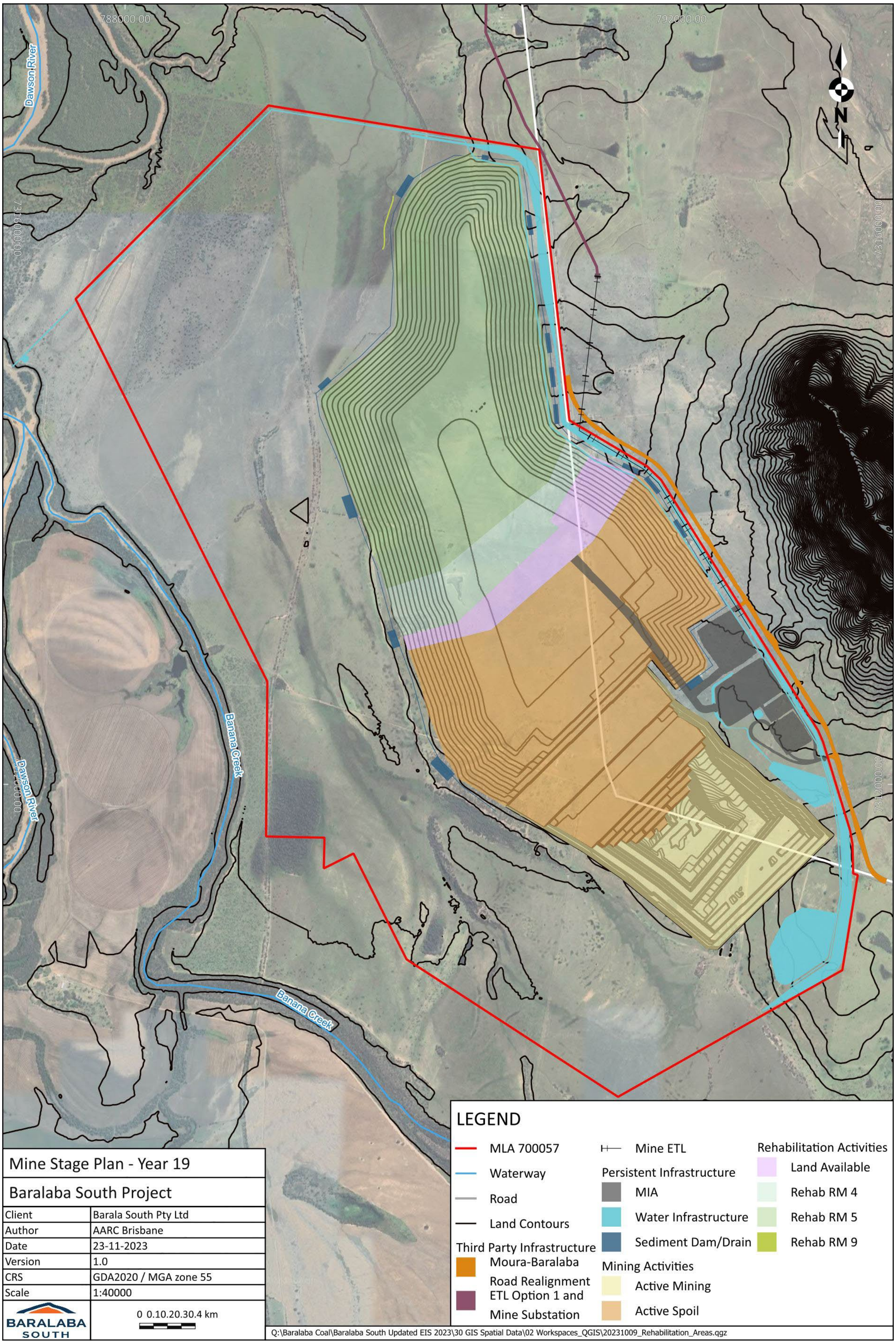


Figure 3.23: Rehabilitation schedule plan—Year 19 mine plan

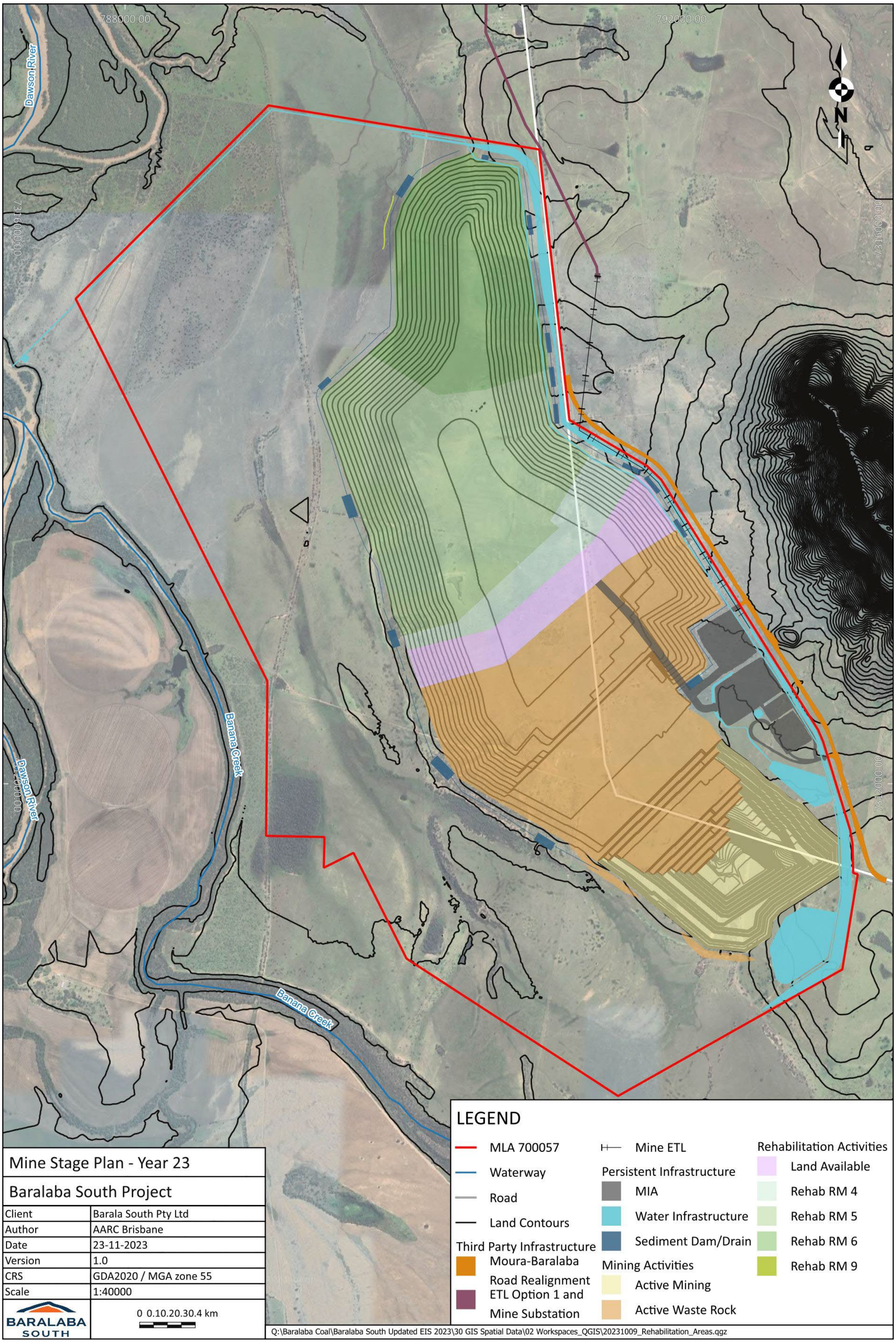


Figure 3.24: Rehabilitation schedule plan—Year 23 mine plan

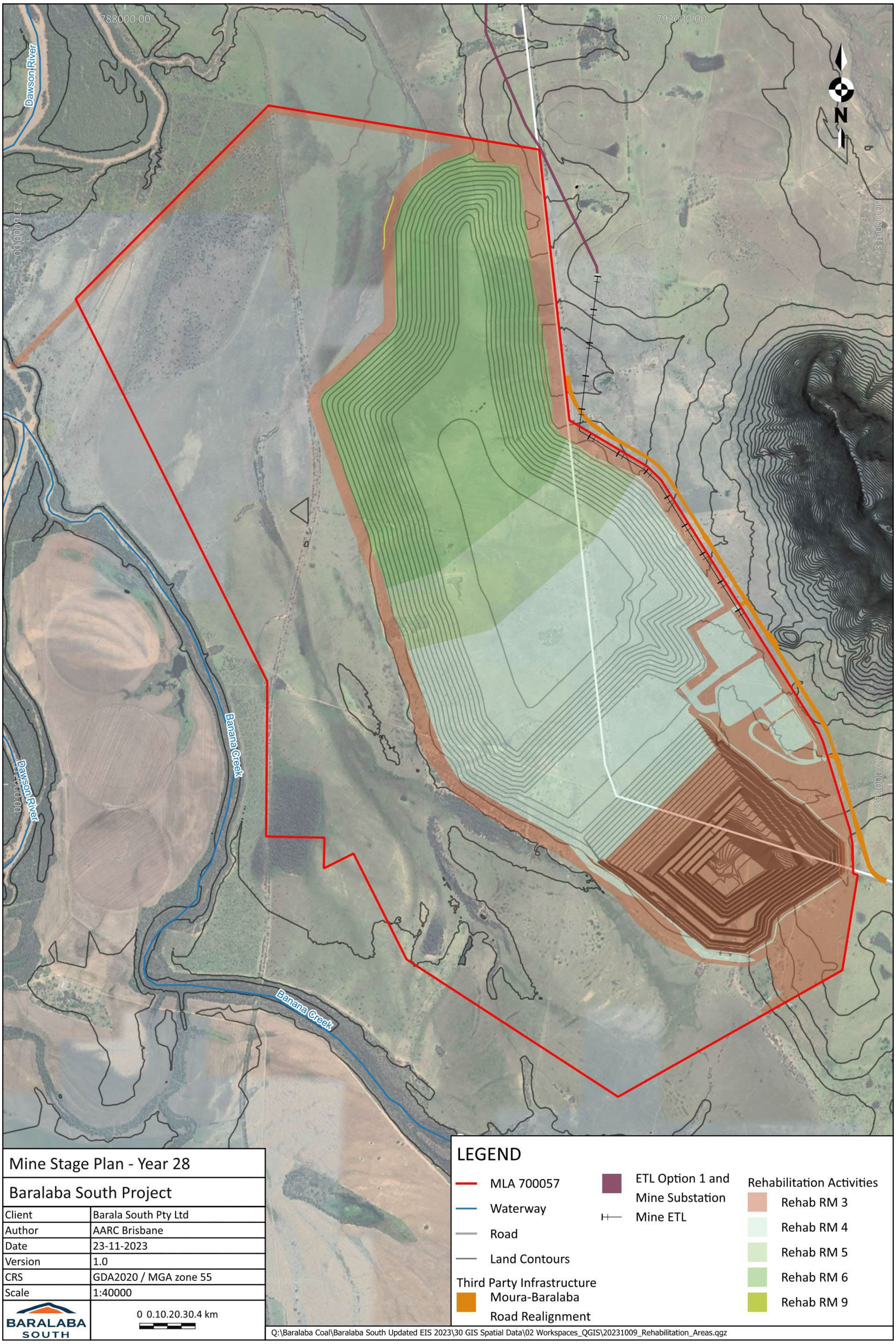


Figure 3.25: Rehabilitation schedule plan – Year 28 post-mining

3.5 Rehabilitation methods and controls

3.5.1 Reshaping and landform development

WREs will generally be constructed as horizontal benches with external faces set back sufficiently from the lower bench to facilitate regrading to the design rehabilitation slope. Regular survey of WRE progression will be undertaken with the aim of ensuring the design landform can be achieved. On completion of dumping to design limits, emplacements usually become available for rehabilitation, with the exception of where service corridors and other access provisions are required to be retained for operational reasons (e.g. haul roads, powerlines, etc.).

For the Project, the indicative progression of spoil emplacement construction is shown in the stage plans in Figure 3.3 to Figure 3.8 and in Table 3.4 that indicate the areas anticipated to become available for rehabilitation as the mine progresses.

A single out-of-pit waste rock emplacement adjacent to the mining pit with elevations of 60 m above the existing landform, and typical slopes of less than or equal to 9° will be remain in the final landform. As operations progress, waste rock will be progressively placed in-pit, commencing from the northern end of the pit, and progressing to the south. Overall slope lengths are typically less than 470 m with contour banks installed to improve landform stability. Slopes in between contour banks are not expected to exceed approximately 235 m.

The final void will be left in a geotechnically stable condition. Bunds will be constructed along the crest of the final void to prevent vehicular access. Fencing may also be used to restrict further access to the final void by unauthorised people, wildlife and/or stock.

Free dig excavation is anticipated for the alluvial cover sediments using hydraulic excavator equipment. Drill and blast methods will be required for excavation of weathered and fresh rock. For final walls, a combination of pre-splitting and trim blasting may be utilised to mitigate damage and achieve the required slope angles. Pre-splitting allows for isolated rock to be blasted from the surrounding rock mass using lightly charged, closely spaced holes to fracture plane along a required design profile. Trim blasting is used to achieve a smooth wall with minimum overbreak using a light charge and a well distributed row of holes along the final excavation line. Alternative blasting techniques may be trialled once initial mining is being undertaken, within interim walls.

For retained highwall or low wall slopes or where interspersed parcels of native vegetation are proposed for cattle shade (low wall), visual relief or other purposes, direct seeding of a mixture of endemic native species will be undertaken. Selected flora species will be used with the intention of providing a suitable food source and shelter for native fauna.

3.5.2 Topsoil management and surface preparation

Prior to placing waste rock, adequate floor preparation is necessary to avoid WRE foundation failures. Weak formation materials will be removed (i.e., topsoils) and surface grading carried out. Where possible, free-draining, and good quality waste rock (non-carbonaceous interburden units) will be placed on the bottom of the WRE. To achieve a uniform consistency, various quality waste rocks should be mixed prior to placement (Appendix AB: Geotechnical Assessment).

Topsoil is a critical factor in achieving successful rehabilitation outcomes and is therefore a valuable resource for the Project. Existing topsoil resources have been identified and described in section 3.2.3 and Appendix K, Soils and Land Assessment.

Topsoil management will be carried out in accordance with a topsoil management plan addressing the following aspects:

- the delineation of topsoil resources based on the soil assessments already undertaken and providing information on stripping depths and topsoil qualities and quantities;

- the delineation of stockpiled topsoil resources to ensure protection from unplanned use or disruption and to assist in prioritising re-use;
- a topsoil stockpiling plan that optimises the placement of topsoil stockpiles to avoid rehandling, is located outside the active mine path, and that nominates stockpile design parameters including height (typically up to 3 m) and batter angles (no greater than 1 in 3), as well as information on applicable construction practices;
- topsoil stockpile revegetation to assist in stabilisation and erosion control; and
- erosion and sediment control methods to be used for areas stripped of topsoil, topsoil stockpiles (including revegetation where warranted) and areas where topsoil is being and has been reapplied, in order to minimise topsoil loss.

A topsoil inventory will be maintained for the life of the Project to account for the volumes and locations of topsoil to be progressively stripped, stockpiled and reapplied. The topsoil inventory will assist early identification of potential issues, such as soil balance deficits or poorer quality soils, enabling remedial actions to be planned in advance of mining operations.

Topsoil will be respread on reshaped landforms either by scraper or by transporting it to the work area by dump truck and subsequently spreading. The topsoiled area will be deep ripped on the contour to bind the subsoil and topsoil interface and create sufficient surface roughness to assist with plant germination as well as provide early erosion control.

3.5.3 Revegetation

Areas subject to rehabilitation areas will be revegetated once final reshaping, topsoil spreading and surface preparation has been completed. The primary objective of the revegetation plan is to reinstate self-sustaining vegetation communities suitable for the target improved pastures for grazing and natural ecosystem PMLU. The plant species have been selected with the aim of restoring grazing land and to provide a source of nutrients (namely carbon) input to the pit lake. The introduction of carbon and nutrients to the pit lake catchment will assist in the ecological progression of the lake (Lund and Blanchette 2021).

While some regeneration may occur from seed stock retained in respread topsoil, this is not a reliable method of revegetation. Individual native shrubs and trees will propagate from the natural seedbank and adjacent undisturbed areas, these trees will be retained as shade vegetation.

3.5.3.1 Growth media and ameliorants

Topsoils are generally suitable for supporting plant growth; however, some topsoils were identified as having alkaline pH with dispersive properties (e.g., Thalberg), likely requiring ameliorants to compensate for high pH and nitrogen deficiency. Prior to topsoil application and seeding in rehabilitation areas, soil nutrient status will be confirmed, and fertiliser applied at recommended rates. Dispersive soils will be treated with gypsum to reduce erosion risk.

3.5.3.2 Surface preparation

Following land reshaping and profiling, topsoil will be placed to achieve a topsoil depth of 0.2-0.25 m (where applicable). Soils will predominantly originate from the Langley SMU, which was identified as the highest quality topsoil on-site. Topsoil will be respread either by scraper or by transporting it to the work area by dump truck and subsequently spreading by grader. The topsoiled area will be deep ripped on the contour to bind the subsoil and topsoil interface and create sufficient surface roughness to assist with plant germination as well as provide early erosion control.

3.5.3.3 Species mix and application

For the PMLU of improved pastures for grazing, direct seeding of selected pasture species will be conducted. A provisional seed selection for a grazing PMLU has been developed based on terrestrial field surveys for the Project EIS which indicated that the species listed in Table 3.5 were prevalent in the ground layer of cleared areas and are utilised by cattle. Recommended seed sowing rates have been selected based on recommendations from the Department of Agriculture and Fisheries (2017), relevant guidelines (DAFF, 2013; Australian Government, 2016) and seeding rates utilised at the Baralaba North Mine. A total target seeding rate of 10–20 kg/ha will be utilised. Higher seeding rates, or oversowing, may be utilised for steeper slopes to aid in erosion protection and seed bank development.

Final seed selection and seeding rates will be based on recommendations by local agronomists, species composition pre-mining, species composition of pasture in surrounding areas (analogue sites), the outcomes of rehabilitation monitoring and trials and the availability of seed at the time of planting.

Table 3.5: Provisional species list and sowing rates for a PMLU of improved pasture grazing

Species	**Preliminary sowing rates (kg/ha)**
Buffel grass (*Cenchrus ciliaris*)	4
Purpletop Rhodes grass (*Chloris inflata*)	4
Green Panic (*Megathyrus maximus var.publigumis*)	4
Mitchell Grass (*Astrebla species*)	4
Forest Bluegrass (*Bothriochloa bladhii*)	2
Green couch (*Cynodon dactylon*)	4
Queensland Bluegrass *(Dichanthium sericeum)*	2
Native Sensitive Plant (Neptunia gracilis)	2
Rhyncho (Rhynchosia minima)	2
Woolly Glycine (Glycine tomentella)	2
Desmanthus (Desmanthus spp)	2
Phasey Bean (*Macroptilium lathyroides*)	2
Cover crop (e.g., *Sorghum arudinaceum)*	6
Total minimum sowing rate (excluding cover crop)	**10–20**

For retained highwall slopes or where interspersed parcels of native vegetation are proposed for cattle shade, visual relief or other purposes, direct seeding of a mixture of endemic native species will be undertaken. Selected flora species will be used with the intention of providing a suitable food source and shelter for native fauna. Endemic and native flora species, as shown in Table 3.6, have been determined based on the pre-mining ecological flora surveys and are, therefore, considered an appropriate selection for initial revegetation efforts. A minimum total target seeding rate of 10–20 kg/ha of seed mix will be utilised. Preliminary seeding rates have been developed based on recommendations from relevant guidelines (Australian Government, 2016) and seeding rates utilised at the Baralaba North Mine.

The timing of seeding activities will be scheduled with consideration of the local climate to target a period that will result in optimum germination rates. Periods of heavy rainfall or periods of rainfall deficiencies (e.g. winter) will be avoided. Where possible, seeds will be harvested locally or purchased commercially with priority placed on locally sourced product. Seeds will be sown using methods appropriate to the terrain—either by hand, by tractor-mounted spreader or by air.

Table 3.6: Seed species suited for native ecosystem establishment

Scientific name	Common name	Preliminary sowing rates (kg/ha)
Trees (minimum of four species)		
Acacia rhodoxylon	Rosewood	0.25
Acacia harpophylla	Brigalow	1
Acacia salicina	Sally Wattle	0.25
Corymbia tessellaris	Carbeen	0.1
Eucalyptus populnea	Poplar Box	0.1
Eucalyptus tereticornis	Queensland Blue Gum	0.1
Lysiphyllum carronii	Red-flowered Bauhinia	1
Shrubs (minimum of four species)		
Alphitonia excelsa	Red Ash	0.25
Petalostigma pubescens	Quinine Bush	0.5
Eremophila mitchellii	False Sandalwood	0.2
Carissa ovata	Currant Bush	0.4
Acacia excelsa	Ironwood	0.25
Atalaya hemiglauca	Whitewood	0.4
Breynia oblongifolia	Coffee Bush	0.1
Alstonia constricta	Bitterbark	0.25
Eleocharis pallens	Pale Spike-sedge	0.4
Groundcover		
Themeda triandra	Kangaroo Grass	3
Heteropogon contortus	Black Speargrass	3
Bothriochloa decipiens	Pitted Bluegrass	2
Cynodon dactylon var. dactylon	Couch Grass	6
Lomandra multiflora	Many-headed Mat Rush	2
Lomandra filiformis	Wattle Mat Rush	2
Neptunia gracilis	Native Sensitive Plant	1

As land is progressively rehabilitated, rehabilitation methods will be continually reviewed to ensure that iterative improvements are made throughout the life of the mine to enhance rehabilitation outcomes.

3.5.4 Rehabilitation maintenance

Significant rainfall events, floods, fire, drought, pest species outbreaks or other factors may result in a requirement for maintenance of rehabilitated areas. Improvement of rehabilitated areas may also be required where rehabilitation monitoring results indicate that the expected trajectory towards achieving completion criteria is not being met. Maintenance/improvement activities may include:

- earthworks repair of erosion areas;
- re-seeding of specific species;
- supplementary planting of tube-stock;
- additional fertiliser or other ameliorant applications; and
- repair or alteration of drainage structures.

In the event that maintenance is required, a maintenance program will be developed that assesses:

- the risks associated with re-disturbing a previously rehabilitated area (e.g. with earthmoving equipment);
- sourcing of topsoil or other ameliorants;
- impacts on installed drainage systems or structures; and
- additional erosion and sediment control requirements and revegetation methods.

The maintenance plan will be triggered through a land disturbance permit system (refer section 10.5 of Chapter 11, Land and Visual Amenity).

3.6 Rehabilitation indicators and completion criteria

The TOR for this EIS and the guideline 'Rehabilitation requirements for mining resource activities' (DES, 2018a) require the nomination of rehabilitation performance indicators and completion criteria for mining resource activities. Rehabilitation performance indicators are intended to provide defensible measurements of progress towards rehabilitation targets—referred to as milestone criteria and completion criteria.

Milestone and completion criteria are required to be consistent with the SMART principles (i.e., specific, measurable, achievable, realistic and timely). They should:

- be outcome-based (linked to the end land use);
- be flexible to adapt to changing circumstances;
- be able to evolve as the mine life progresses;
- include metrics suitable to demonstrate that rehabilitation is trending positively;
- undergo periodic review; and
- include a measurement approach that details how the criterion will have been met (CoA 2016, ANZMEC and MCA 2000).

A set of milestone criteria for each discrete rehabilitation area has been developed for the Project to provide a clear definition of milestone completion and successful rehabilitation. The milestone criteria demonstrate the completion of progressive rehabilitation events and achievement of the final PMLU to a stable and sustainable condition at surrender.

Completion criteria and indicators have been developed for the Project to demonstrate:

- productivity of the land (for grazing land uses);
- sufficiency of vegetation cover;
- rates of erosion and sediment loss;
- improving soil health;
- geotechnical stability of rehabilitated areas (including slope length, slope gradient);
- quality of water runoff at various upstream and downstream monitoring locations;
- containment and treatment of any polluted runoff;
- engineering standards and certifications for decommissioned and rehabilitated infrastructure;
- remediation of any contaminated land;
- cattle grazing capacity on rehabilitated pastures; and
- that the final void 'natural' ecosystem is in a stable and sustainable condition.

The proposed performance indicators and criteria for the Project are outlined in the draft PRC Plan (Appendix AA, Draft Progressive Rehabilitation and Closure Plan).

3.7 Rehabilitation monitoring and measurement

Rehabilitation monitoring for the Project will be aimed at assessing the success of rehabilitation having regard to the rehabilitation objectives and completion criteria.

Rehabilitation monitoring will be used to track the progress of revegetated areas and determine requirements for intervention, such as weed control or supplementary planting. Rehabilitation monitoring will also:

- evaluate coverage and application of topsoil prior to seeding;
- monitor drains and assess water quality to determine whether substantial silting of inverts and/or any localised failure of drain embankments has occurred;
- evaluate topsoiled areas following rain events (particularly on slopes) to assess whether significant rill development or loss of topsoil has occurred;
- evaluate the behaviour of placed topsoil over time (i.e. erosion or dispersion, compaction, salting or hard setting);
- assess germination success in revegetated areas (including diversity and abundance);
- monitor revegetation success over time (survival rate, plant growth, species diversity, weed content, fauna usage);
- evaluate potential threats to rehabilitated areas (e.g. weed invasion, pest species, dispersive soils, erosion);
- record fauna usage of the highwalls and final void pit lake;
- monitor water quality of the final void; and
- record key rehabilitation information (e.g. photographic records, surveys, file notations).

Rehabilitation monitoring will be defined through a Rehabilitation Monitoring Program detailing the objectives, methodology, timing and frequency appropriate for the Project. The results of rehabilitation monitoring will be captured through various monitoring reports and assessed against the milestone criteria outlined in the PRC Plan Schedule (Appendix AA, Draft Progressive Rehabilitation and Closure Plan).

3.7.1 Monitoring timing and frequency

Rehabilitation will be monitored typically on an annual basis, with the survey period occurring post-wet season, as monitoring at this time allows for more accurate identification of the species present and a clearer understanding of species richness on-site. Where sufficient data is acquired that demonstrates that rehabilitation is clearly on a trajectory to achieve milestone criteria, the frequency of monitoring will be reviewed and amended as appropriate.

3.7.2 Monitoring methodology

A transect-based approach (consistent with the bio-condition methodology) has been selected for rehabilitation monitoring. This approach aims to scientifically and comparatively measure the pre- and post-mining ecosystems.

Multiple reference sites will be established on and around the Project site that best represent pre-mining ecosystems. For example, reference sites representative of the proposed PMLU of grazing on improved pastures will be established prior to the commencement of the Project.

Structured, periodic monitoring of reference sites will help develop an understanding of the pre-mining landscape to assist in the future planning and refinement of rehabilitation strategies, as well as provide data for determination of completion criteria when assessing rehabilitation success.

Rehabilitation transect sites will also be established within rehabilitated landforms post-mining. At each transect site, the following parameters will be monitored at an appropriate frequency (notionally annually):

- aspect and slope;
- tree density (trees/ha);
- shrub density (shrubs/ha);
- herb/grass density (grasses/ha);
- groundcover (%);
- species composition;
- chemical and physical soil indicators;
- erosion indicators (depth of rills or erosion lines, surface crusting, slopes); and
- photographic records of the site.

In addition to the rehabilitation transect monitoring approach, other site environmental monitoring will continue throughout and following the life of the mine (e.g. surface water monitoring). These data sets will also work to further inform rehabilitation methodologies.

In accordance with current standards, rehabilitation monitoring will ultimately aim to demonstrate that rehabilitation area completion criteria have been met. Surface water quality monitoring for the Project will continue to be undertaken for the analytes listed and locations identified in the EA until the requisite milestone criteria are achieved.

Final void ecosystem monitoring will be used as a monitoring tool to assist in determining the achievement of land with a target PMLU of 'natural' ecosystem. A suite of water quality parameters and fauna observations will be sampled as the void begins filling for a period of 25 years. It is expected that as research progresses, sampling measures and parameters may change, and the below methodology is preliminary based on current research (Blanchette and Lund, 2021).

A comprehensive monitoring program for each milestone is provided in section 3.7 of Appendix AA, Draft Progressive Rehabilitation and Closure Plan.

3.7.3 Review of rehabilitation monitoring data

Collated rehabilitation monitoring data will be used to review rehabilitation success. This will occur through:

- tracking revegetation and/or regeneration progress against performance indicators and completion criteria;
- assessing the performance of landform designs and rehabilitation concept methods;
- evaluating the effectiveness of environmental management measures and controls; and
- identifying the requirement for intervention strategies or ameliorative/contingency measures.

The results of any industry rehabilitation trials and investigations will also continue to be used to inform and refine future rehabilitation concepts, practices and measures.

3.8 Closure and relinquishment

As stated in section 3.1, the PRC Plan and PRC Plan schedule for the Project will state the measurable completion criteria against which the Project rehabilitation will be assessed; and to determine the extent to which the rehabilitation or management milestones for each PMLU have been achieved.

At the point in time that rehabilitation monitoring indicates that completion criteria and milestones have been achieved for all or part of the rehabilitation undertaken for the Project, the Proponent may either:

- apply for progressive certification of the area of land that has been successfully rehabilitated; or
- apply to surrender the EA over the relevant area that has been successfully rehabilitated and submit to DES a post-mining management report that states any requirements for the ongoing management of the land.