



TRANSITIONAL PROGRESSIVE REHABILITATION AND CLOSURE PLAN LUCKY BREAK PROJECT

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Table of Contents

1	Introduction	1
2	Scope and objective	2
3	Project planning part.....	3
3.1	Project planning	3
3.1.1	Project description	3
3.1.2	Existing rehabilitation.....	6
3.1.3	Climate	15
3.1.4	Geological setting.....	16
3.1.5	Topography and surface hydrology.....	17
3.1.6	Groundwater	19
3.1.7	Land and soil.....	21
3.1.8	Flora and fauna	24
3.2	Community consultation	31
3.2.1	Previous stakeholder and community engagement activities	31
3.2.2	Ongoing stakeholder engagement	31
3.3	Post-mining land use	36
3.3.1	Land outcome documents.....	36
3.3.2	Proposed post-mining land uses	36
3.4	Non-use management areas.....	40
3.4.1	Land outcome documents.....	40
3.4.2	Proposed non-use management areas	41
3.5	Rehabilitation management methodology	43
3.5.1	Rehabilitation objectives.....	43
3.5.2	Rehabilitation areas and improvement areas	43
3.5.3	Rehabilitation milestones.....	43
3.5.4	Management milestones	46
3.5.5	Milestone criteria and completion criteria	46
3.5.6	Rehabilitation timeframes.....	55
3.5.7	Final landform design	60
3.5.8	General rehabilitation practice	63
3.6	Risk assessment	75
3.6.1	Risk assessment requirements.....	75
3.6.2	Risk assessment process	75
3.6.3	Risk assessment schema	76
3.6.4	Risk assessment outcomes and management	80
3.7	Monitoring and maintenance	81

3.7.1	Monitoring program design	81
3.7.2	Satellite-derived fractional vegetation cover ML 10324 (Dingo Dam)	82
3.7.3	ML 10332 (Lucky Break) monitoring program.....	83
3.7.4	Maintenance	83
4	References	89

List of Appendices

Appendix A:	Rehabilitation schedule
Appendix B:	Rehabilitation closure plan reference map
Appendix C:	Stakeholder engagement consultation template
Appendix D:	Rehabilitation monitoring plan
Appendix E:	Provided technical studies
Appendix F:	Rehabilitation risk assessment
Appendix G:	Rehabilitation monitoring report 2023

List of Figures

Figure 1:	Project locality	4
Figure 2:	Project layout prior to rehabilitation	5
Figure 3:	Drone survey of current site conditions 2022 (drone imagery overlain global imagery)	10
Figure 4:	Average monthly rainfall for the Project region between 2010–2022	15
Figure 5:	Average monthly total evaporation between 2010–2022	16
Figure 6:	Monthly average maximum and minimum temperatures.....	16
Figure 7:	Regional catchments.....	18
Figure 8:	Local watercourses by Strahler stream order (pre-mining)	20
Figure 9:	Local land use.....	22
Figure 10:	Soils of the Project	23
Figure 11:	Pre-mining distribution of vegetation communities	29
Figure 12:	Remnant vegetation.....	30
Figure 13:	Project PMLUs and NUMA	42
Figure 14:	Rehabilitation and improvement areas reference map	44
Figure 15:	Figure 3: Surface Water and Stream sediment Monitoring Sites	52
Figure 16:	Final landform design.....	62
Figure 17:	Snake Creek: extreme storm event inundation	65
Figure 18:	Final overland flow pathway.....	70
Figure 19:	Water quality monitoring locations	71
Figure 20:	North REF 1 monitoring location March 2022	84
Figure 21:	DRILL 1 monitoring location March 2022.....	84

List of Tables

Table 1:	Project tenements.....	3
Table 2:	Authorised ERAs.....	3
Table 3:	Summary of rehabilitation activities undertaken	7
Table 4:	Achievement of revegetation and landform completion criteria ¹	9
Table 5:	Site photographs from 2015 to 2023	11
Table 6:	Resource tenements immediately proximate to the Project.....	21
Table 7:	Pre-mining vegetation community summary	24
Table 8:	Fauna species found on the Project site (AARC 2006b)	26
Table 9:	Remnant regional ecosystems within the Project	28
Table 10:	Summary of past community consultation	32
Table 11:	Rehabilitation requirements in accordance with the Project EA	36
Table 12:	Post mining land uses (reproduced from Table 4 of the PMLUP)	37
Table 13:	Proposed PMLU.....	40
Table 14:	Nominated rehabilitation and improvement areas	45
Table 15:	Milestones and their applicability to nominated RAs	45
Table 16:	Management milestones	46
Table 17:	Rehabilitation milestone criteria.....	47
Table 18:	Erosion classification framework	50
Table 19:	Table 1. Surface water quality limits	50
Table 20:	Table 2. Surface Water and Stream sediment Monitoring Sites.....	51
Table 21:	Table 3. Analogue/Reference sites	53
Table 22:	Table 4. Grazing Species Mix.....	53
Table 23:	Table 5. Grassland Species Mix	54
Table 24:	Management milestone criteria	55
Table 25:	Justification of timeframes for achievement of milestones	56
Table 26:	Consequence category assessment (ATC Williams 2019d)	68
Table 27:	Species selected for low intensity grazing	74
Table 28:	Species selected for grassland land use	74
Table 29:	Control effectiveness ranking	77
Table 30:	Likelihood of exposure to the hazard	78
Table 31:	Consequence classification descriptors	79
Table 32:	Risk level classification matrix.....	80
Table 33:	Risk assessment outcomes by RA / IA.....	80
Table 34:	Rehabilitation monitoring and management program for RAs and IA	85

Table of Abbreviations

AARC	AARC Environmental Solutions Pty Ltd
AEP	Annual Exceedance Probability
AQP	Appropriately qualified person
AUZ	Australian Mines Limited Pty Ltd
EA	Environmental Authority
EP Act	<i>Environmental Protection Act 1994</i>
EP Regulation	Environmental Protection Regulation 2019
ERA	Environmentally relevant activity
FOS	Factor of safety
FVC	Fractional vegetation cover
IA	Improvement area
LOD	Land outcome document
ML / MLs	Mining Lease / Mining Leases
MM	Management milestone
NUMA	Non-use management area
PMLU	Post-mining land use
PMLUP	Post-mining land use plan
PRCP	Progressive Rehabilitation and Closure Plan
PRCP Guideline	Progressive Rehabilitation and Closure Plan Guideline
QNPL	Queensland Nickel Pty Ltd
RA	Rehabilitation area
RE	Regional ecosystem
REMP	Receiving environment monitoring plan
RM	Rehabilitation milestone
RMP	Rehabilitation monitoring plan
ROM	Run of Mine
Sconi	Sconi Mining Operations Pty Ltd
SLSA	Soils and land suitability assessment
WRD	Waste rock dump

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) has been commissioned by Australian Mines Limited Pty Ltd (AUZ) to develop a Progressive Rehabilitation and Closure Plan (PRCP) for the Lucky Break Project (the Project) in accordance with the requirements of the *Environmental Protection Act 1994* (EP Act).

This PRCP is applicable to mining leases (MLs) ML 10332, ML 10324. The current version of the Environmental Authority (EA) EPML00900713 for the Project was issued on 26 October 2020 to Sconi Mining Operations Pty Ltd.

The EA authorises the environmentally relevant activity (ERA) of ERA 'Mining nickel ore' under schedule 3 of the Environmental Protection Regulation 2019.

2 Scope and objective

The purpose of this PRCP is to describe how progressive rehabilitation will be carried out at the Project. The PRCP has been developed in accordance with the requirements of the Progressive Rehabilitation and Closure Plan Guideline (DES 2021a) (PRCP Guideline), which states that the PRCP must include the following parts:

Rehabilitation Planning part:

The purpose of the rehabilitation planning part of the PRCP is to support and justify the development of the proposed PRCP schedule. This part must detail how progressive rehabilitation and closure will be carried out over the entire Project site and on both a rehabilitation area basis and improvement area basis. The key components of the rehabilitation planning part for the Project are:

- community consultation information (refer Section 3.2);
- post-mining land use (PMLU) and/or non-use management area (NUMA) determination (refer Section 3.3);
- rehabilitation and management methodology (refer Section 3.5);
- risk assessment (refer Section 3.6); and
- a monitoring and maintenance program (refer Section 3.7).

Rehabilitation Schedule part:

The rehabilitation schedule is a required element of a PRCP. Once approved, the schedule becomes a legally binding and enforceable instrument with which the Project must comply. The schedule must include:

- nomination of either a PMLU or NUMA for all land within the relevant resource tenures, including land uses for undisturbed land;
- identification of when land becomes available for rehabilitation or improvement;
- rehabilitation or management milestones to achieve the PMLU or NUMA outcomes;
- milestone criteria that demonstrate when each milestone has been completed;
- completion dates for each milestone to be achieved; and
- any conditions considered necessary or desirable.

Once approved, the rehabilitation schedule, along with the milestone criteria will be incorporated into a PRCP schedule to be attached to the EA. The administering authority may also impose conditions within the PRCP schedule if it considers the condition is necessary or desirable (section 4.2 of the PRCP Guideline). Two deemed conditions are to be included in all PRCP schedules in accordance with section 206A of the EP Act. The first condition states that when carrying out a relevant activity under the PRCP schedule, the holder must comply with a requirement stated in the EA relevant to carrying out the activity.

The second condition states that the holder must comply with the following matters stated in the schedule:

- each rehabilitation milestone and management milestone, and
- when each rehabilitation milestone and management milestone is to be achieved.

3 Project planning part

3.1 Project planning

3.1.1 Project description

The Lucky Break Project is located at the Spyglass Beef Research station, approximately 100 km north of Charters Towers and 140 km west of Townsville in north Queensland (Figure 1). The Project is a legacy mine site that is currently undergoing final rehabilitation, with no new disturbance, mining or processing activities proposed for the site in the future. The Project incorporates two MLs identified as ML 10324 ('Dingo Dam') and ML 10332 ('Lucky Break'), with a combined area of 102.7 ha. The Project tenements are listed in Table 1 and shown on Figure 2.

Table 1: Project tenements

Tenement	Permit name	Permit status	Grant date	Expiry date	Surface area (ha)	Real property description
ML 10324	Dingo Dam	Granted	16/02/2005	28/02/2026	36.2	Lot 1 OC57
ML 10332	Lucky Break	Granted	22/11/2007	30/11/2027	66.5	Lot 1 OC57

3.1.1.1 Project activities

The ERAs under schedule 2 and schedule 3 of the Environmental Protection Regulation 2019 (EP Regulation) authorised by the EA are listed in Table 2. The activities scheduled to occur during the current Plan of Operations are limited to ongoing environmental monitoring and rehabilitation maintenance within the Dingo Dam ML. The term of the current Plan of Operations is 2 November 2018 to 1 December 2023 (refer Appendix E).

Table 2: Authorised ERAs

ERA	ERA description	Location
Schedule 3 of the EP Regulation		
13 Mining nickel ore	Mining nickel ore	ML 10332 and ML 10324
Schedule 2 of the EP Regulation		
33(1) Crushing, milling, grinding or screening	Crushing, milling, grinding or screening (the relevant activity) consists of crushing, grinding, milling or screening more than 5,000 t of material in a year	ML 10332 and ML 10324

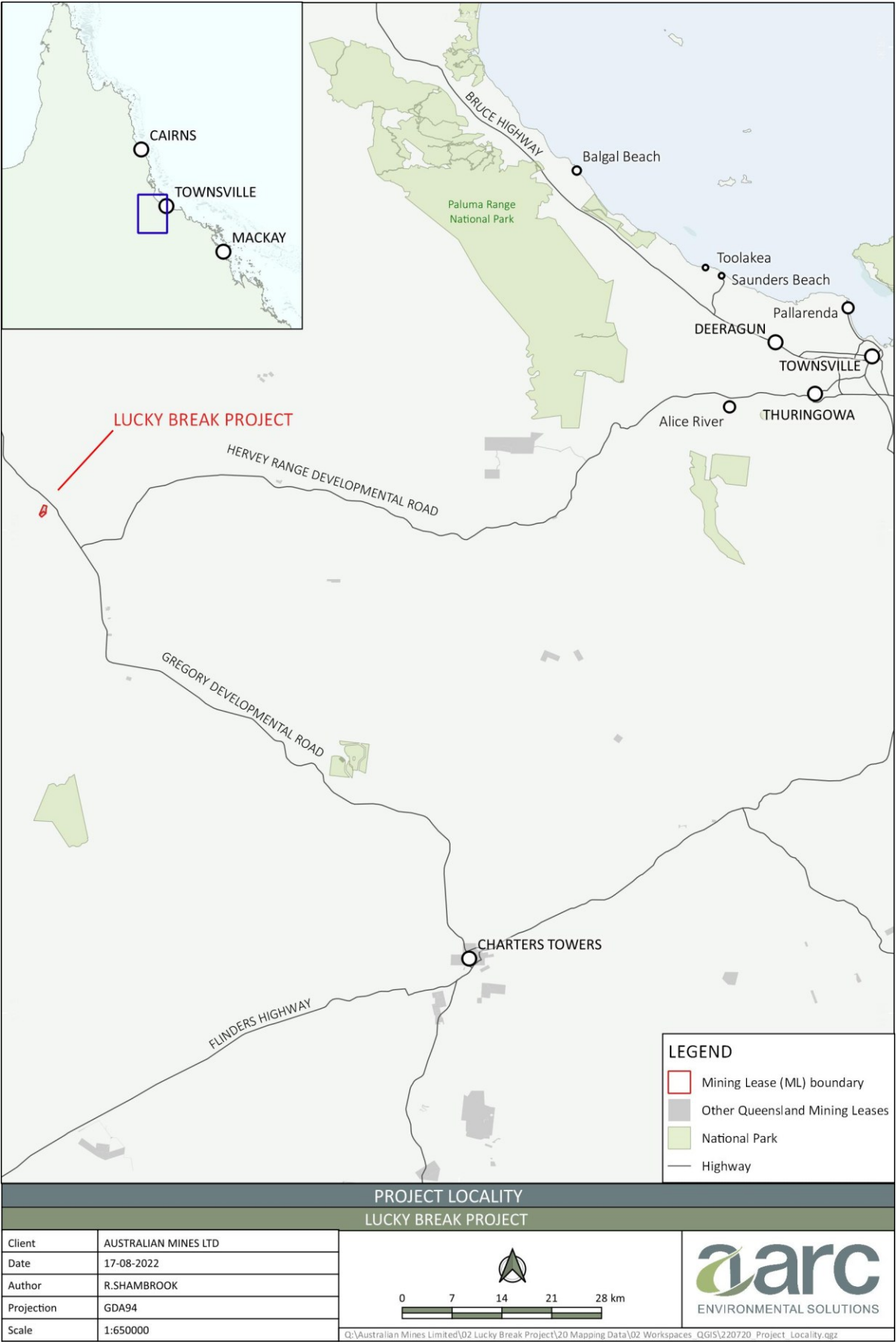


Figure 1: Project locality



Figure 2: Project layout prior to rehabilitation

3.1.1.2 Mining operations and site layout

Exploration activities were undertaken on the Lucky Break ML in 2004 and 2005 and the associated disturbance has since been rehabilitated. No mining activities on this ML subsequently occurred.

Between March 2015 and July 2015 Queensland Nickel Pty Ltd (QNPL) mined approximately 114 kt (ore product tonnes) of nickel ore from the Dingo Dam deposit (ML 10324) under EA EPML009007131 held by Nornico Pty Ltd. Haulage of the final stockpiles of ore was completed on July 22nd 2015 and the demobilisation of all equipment and infrastructure was completed on July 27th 2015. The EA transfer to Sconi Mining Operations Pty Ltd, a subsidiary of Australian Mines Limited was finalised in March 2018.

The mining campaign specifically targeted nickel ore within the deposit that was suitable for processing at the QNPL Refinery near Townsville. Nickel ore mined by QNPL was transported to Townsville in B-double trucks via the approved B-double route. Disturbances associated with the mining activity included a waste rock emplacement, run of mine pad, the final void, a sediment dam, an office area, roads and tracks and earthen bunds and drains (Figure 2). The upstream dam referred to in this report as Dingo Dam and which is bisected by the ML boundary, is a pre-existing structure that is the property of the landholder and not subject to the PRCP.

3.1.2 Existing rehabilitation

At the completion of mining activities and prior to the final load out in July 2015, QNPL commenced rehabilitation of the site including removal of infrastructure, re-profiling of the waste rock dump, reducing the batter angles of the final void, installing stormwater controls, ripping hardstand areas, spreading topsoil, seeding and installation of fences. Rehabilitation activities are summarised in Table 3.

Knowledge of the specifics of rehabilitation activities (seeding rates, topsoiling methods etc) undertaken prior to the ownership by AUZ is limited. However, a suite of assessments including soil analysis and void studies were commissioned by AUZ to provide an understanding of site characteristics and future rehabilitation activities that would be required to achieve completion criteria.

Prior to the placement of topsoil, constructed landforms such as the run of mine (ROM) pad were recontoured to resemble the original local topography as far as practicable.

Topsoil on the Project site was of sufficient depth and quality to enable stripping to occur to a depth of 300 mm. It is understood that stripped topsoil was stored in stockpiles no larger than 2 m high and 5 m wide and placed on rehabilitation areas at a thickness of approximately 200 mm to create a growth medium of sufficient depth to hold water and support revegetation. Ripping of the surface occurred prior to spreading topsoil to allow the subsurface and topsoil materials to interlock and to minimise the potential for a hardpan layer to form under the topsoil. Grass and woody vegetation remaining after land clearing was incorporated into the rehabilitation at strategic locations to help limit run-off, (thereby reducing erosion potential by slowing down overland flow), retain active biological activity and provide habitat for returning fauna.

A phosphorous based fertiliser is understood to have been applied to rehabilitation areas to combat naturally low soil phosphorous levels to better support the establishment of self-sustaining plant communities. Phosphorus levels in the Project soils were found to be below guideline levels for supporting grazing at most sites (AARC 2006a).

All areas previously disturbed by mining activities have been subjected to rehabilitation maintenance and monitoring activities. Some areas of existing disturbance are planned to undergo remedial works to improve the final drainage layout in accordance with an updated water management plan and to mitigate some identified minor areas of erosion and poor revegetation. Some of these remedial works were undertaken in November 2022.

Exploration and drilling activities undertaken within the Lucky Break ML were also subject to rehabilitation activities prior to AUZ acquiring the leases. Photographic records indicate that disturbance associated with drill pads was minimal. All exploration holes were permanently plugged and drill pad areas rehabilitated.

Table 3: Summary of rehabilitation activities undertaken

Mine domain		Rehabilitation activities understood to have been carried out	Intended future rehabilitation activities
Infrastructure area	Office area	Removal of infrastructure, rip, grade and seeding. Fertiliser application and native seed mix applied.	Rehabilitation monitoring.
	Haul road	Nil	Haul road to be retained pending discussions with the landowner.
	ROM pad	Removal of infrastructure, rip, grade and seeding. Fertiliser application and native seed mix applied.	Rehabilitation monitoring.
Waste	Waste rock dump (WRD)	Removal of infrastructure, rip, grade and seeding. Fertiliser application and native seed mix applied.	Minor drainage reconfiguration, minor mitigation works, hydroseeding, monitoring.
Water management infrastructure	Sediment dam	Appears to have been retained, significant revegetation has occurred.	Area to be retained as is pending discussions with the landowner.
	Stormwater management system	Construction of drains, bunds etc. Structural works, rip, grade and seeding. Fertiliser application and native seed mix applied.	Review of stormwater management system undertaken and various modifications proposed. Phase 1 'critical' works for the Stormwater management system were undertaken in November 2022, with phase 2 'final' works proposed for the 2023 dry season.
Residual void	Dingo Dam pit	Stabilise pit walls, reprofile and topsoil to reduce batter angles. Install safety berms. Perimeter fencing erected.	Rehabilitation monitoring, signage to be installed.
Exploration area (ML 10322)	Exploration holes	Capping and minor recontouring and natural regeneration of vegetation.	Rehabilitation monitoring.

3.1.2.1 Rehabilitation monitoring outcomes

Field-based assessments of rehabilitation progress have been undertaken in September 2018 and then again in March 2022, to provide a broad assessment of final landform stability and the success of past rehabilitation activities. The assessments involved surface water, stream sediment, topsoil quality sampling and analysis and a visual assessment of vegetation establishment and erosion to determine environmental values on the Project site and surrounding receiving environments. Drone imagery capturing the current condition of the site was collected in 2022 and is shown in Figure 3.

For the most part, final landforms were found to be stable with minor and moderate areas of erosion occurring infrequently on the slopes of the WRD and final void. Rehabilitation success in terms of vegetation cover was limited across the Project site in 2018 with the western portion of the WRD supporting the most prominent area of established groundcover vegetation. Groundcover species identified in rehabilitation areas included *Heteropogon contortus*, *Melinis repens*, *Aristida spp.*, *Chloris gayana*, *Stylosanthes scabra*, *Urochloa mosambicensis* and *Sclerolaena spp.* A small number of pioneering Acacia shrubs were scattered across the rehabilitation areas.

Monitoring undertaken in 2022 demonstrates that vegetation cover has improved, with most monitoring locations achieving the target completion criteria set out in the PMLUP for ground cover, weeds and pasture species and forbs species diversity.

Rehabilitation monitoring at the Project in 2022 indicates that the site meets the target vegetation and landform stability criteria across most domains (Table 4), where:

- Total ground cover at rehabilitation sites meets the target criteria of 69% at the ROM pad and office monitoring locations only. Groundcover was reported between 60% at the void to 94% at the ROM pad.
- All rehabilitation sites meet the target completion criteria for species diversity of pasture grasses (1.1%) and forbs (3.5%) with average species diversity at rehabilitation sites ranging between 2.3% at the void to 4.0% at the office for pasture grasses and 4% at the office and 6% at the waste rock dump for forbs.
- Reference monitoring locations report a higher diversity and cover of trees and shrubs compared to rehabilitation locations, which is expected given that the target PMLU is a grazing landscape. An increase in tree cover would result in a decrease in ground cover for grazing pasture.
- Two weed species were recorded at reference monitoring locations and only one species reported at the ROM pad, the Stinking Passionflower. All rehabilitation sites meet the completion criteria for weeds.
- Analysis of FVC indicates that most rehabilitation areas have either met or are progressing towards the performance target of 85%. Exploration drilling areas meet the FVC performance target, with 100% of all monitoring points exceeding the 1st quartile of reference sites. The 1st quartile of reference sites is exceeded at 76%.
- The Sediment Dam and ROM rehabilitation areas have previously been impacted by runoff from significant rainfall events occurring prior to sufficient vegetation being established. Such overflows have caused washouts and ponding in rehabilitation areas, which have impacted vegetation establishment and growth, where rainfall events led to increases in the bare soil fraction. As a result, it is noted that there is a discrepancy between the measured transect ground cover and the modelled FVC for the rehabilitation areas due to the variance within rehabilitation areas historically subject to washout.
- An analysis of the key characteristics of soils at rehabilitation sites indicates that soils have similar characteristics as reference locations. Soils at rehabilitation sites are considered suitable for vegetative growth. Some soils, in particular at the waste rock dump have an Emerson class rating which indicates that they may be susceptible to dispersion and may require application of gypsum to aid in stability.
- Erosion monitoring indicates that erosion at the site is limited to the classification of 'minor' in relation to the number of erosion rills and depth of erosion. Erosion at all monitoring sites meet the completion criteria, with the exception of the waste rock dump.
- Slope analysis indicates that the landform design criteria of waste rock dump slopes of less than 36° has been achieved.
- Photographic monitoring at ML 10332 indicates that vegetative cover at rehabilitation sites is comparable to reference locations.

Table 5 provides photographic examples of the progress of the Project site from end of mining in 2015 to early 2023. Some additional minor reparation activities including drainage works and seeding are planned to be undertaken to address areas where criteria are not being achieved.

The Rehabilitation Monitoring Report for monitoring undertaken in 2022 has been provided in Appendix G.

Table 4: Achievement of revegetation and landform completion criteria ¹

Parameter	Revegetation completion criteria	Rehabilitation areas where criteria have not been achieved	Notes
Vegetation density/percentage of ground cover	Ground cover to be not less than 80% of the average percentage ground cover of analogue sites.	Waste rock dump Sediment dam Void	
Diversity of species	Equal to or greater than 60% of the comparable species diversity of analogue sites.	Nil	
Abundance of weeds	Weeds not to exceed 10% more than average percentage cover of analogue sites.	Nil	-
Landforms	No active rill erosion deeper than 30 cm.	Waste rock dump	
Landform design	WRD batter slopes are <36° to the angle of repose.	Nil	

1. Completion criteria as described in the land outcome document (AARC 2020a).



Figure 3: Drone survey of current site conditions 2022 (drone imagery overlain global imagery)

Table 5: Site photographs from 2015 to 2023

Mine Domain	Rehabilitation in Progress	Current Rehabilitation Status
Office Area	 South easterly view across office area (June 2015)	 South easterly view across office area (March 2022)
ROM	 Eastern extent of WRD facing E across ROM pad (July 2015)	 NE corner of WRD facing SE across ROM pad (April 2023)

Mine Domain	Rehabilitation in Progress	Current Rehabilitation Status
WRD	 NE portion of WRD facing W across WRD (July 2015)	 SW portion of WRD facing E across WRD (April 2023)
Residual Void	 Void – partially rehabilitated (June 2015)	 Northern void embankment – facing WSW (April 2023)

Mine Domain	Rehabilitation in Progress	Current Rehabilitation Status
	 Void – rehabilitation complete (July 2015)	 Northern void embankment – facing ESE (April 2023)
Sediment Dam	 Sediment dam bund – facing east across sediment dam (July 2015)	 SE edge of sediment dam – facing NW across dam (March 2022)

Mine Domain	Rehabilitation in Progress	Current Rehabilitation Status
Exploration area (ML 10322)	 Drill rig set up at Dingo Dam (2005)	 Rehabilitation monitoring transect (ML 10322) (March 2022)

3.1.3 Climate

Climate data for the region was obtained from the SILO grid point nearest the mine (-19.20, 145.70) and the nearest weather station, which is located approximately 20 km south-east of the Project, at Hillgrove Station (#30137). Climate data for the period 2010–2022 has been assessed.

The climate for the Project region is described as a tropical climate associated with variable rainfall conditions. Cooler, dryer months occur over winter and hotter, wetter months over summer. The wet season typically occurs from November to April, with approximately 81% of mean annual rainfall occurring during these months (refer Figure 4). Average annual rainfall for the region is 410.4 mm at Station 30137 and 590.5 mm at the SILO grid point. Total evaporation for the region typically exceeds the total monthly rainfall, with an average annual total evaporation of 2225.3 mm at Station 30137 and 2193.4 at the SILO grid point. Monthly average total evaporation is shown on Figure 5.

The Project region experiences warm days and cool nights. Temperatures as low as 9.3°C are experienced over winter. Maximum temperatures of up to 37.3°C are experienced over summer, with December typically being the hottest month of the year and July the coolest. The average monthly maximum and minimum temperatures for the region are shown on Figure 6.

Maximum, minimum and average temperatures are projected to continue to rise in south-east Queensland. In 2030, average annual temperatures are projected to rise by 0.6–1.3°C above 1986–2005 levels and 1.1–3.3°C by 2070 (DES 2019). Total rainfall is projected to remain constant or decrease by 2070. However, the intensity of heavy rainfall is considered likely to increase (DES 2019).

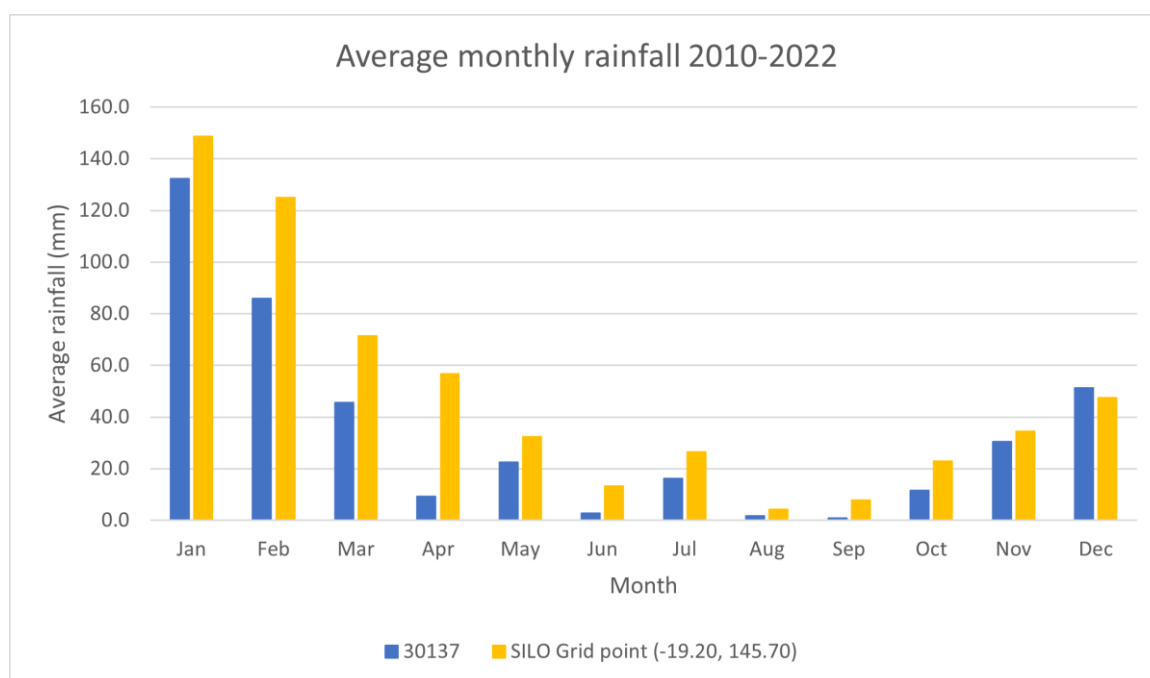


Figure 4: Average monthly rainfall for the Project region between 2010–2022

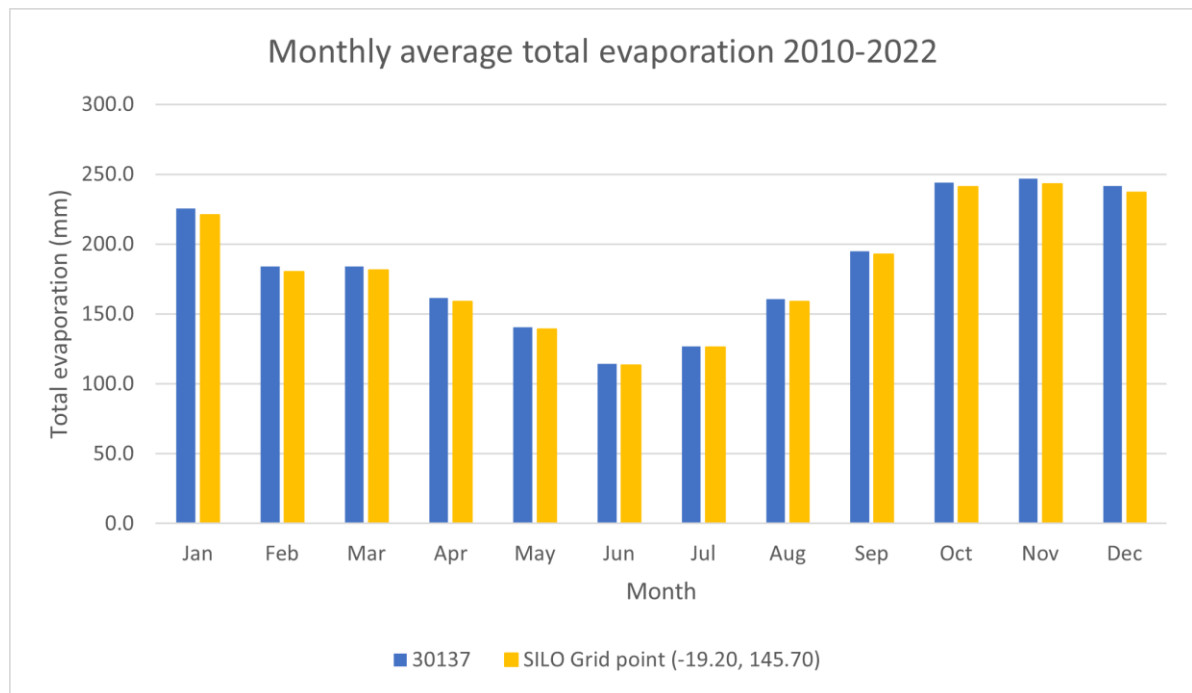


Figure 5: Average monthly total evaporation between 2010–2022

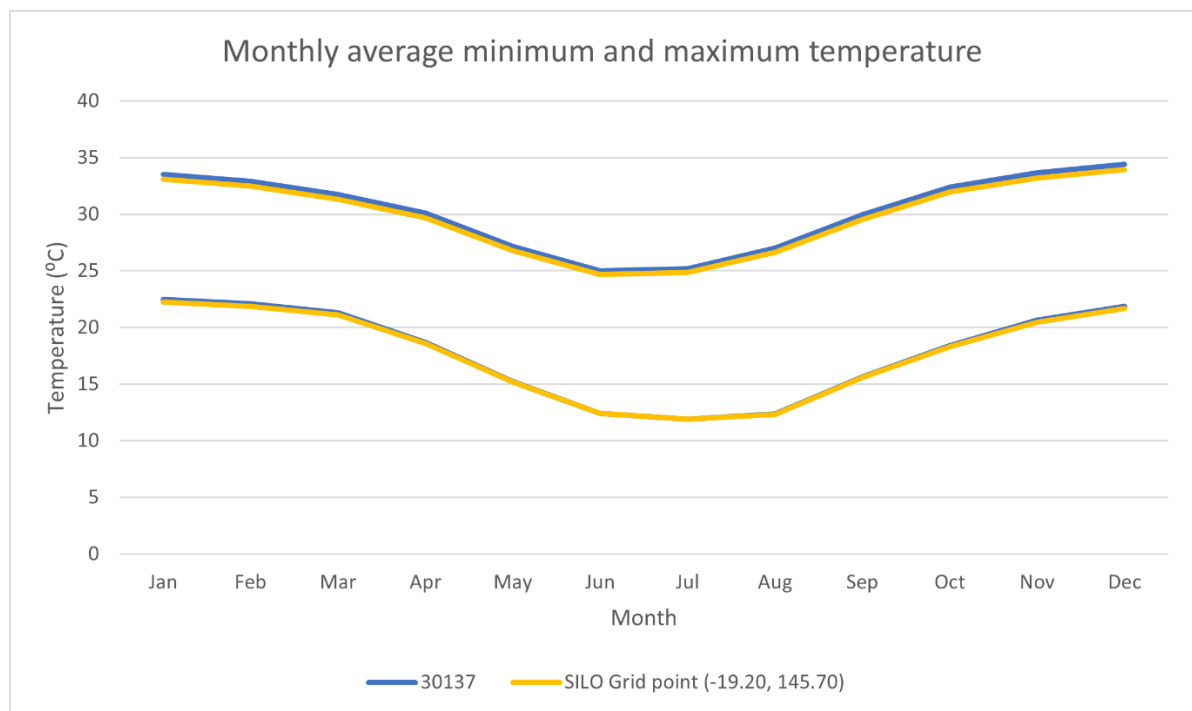


Figure 6: Monthly average maximum and minimum temperatures

3.1.4 Geological setting

The geology of the Project site comprises the Oweenee Granite and the Argentine Metamorphics, which include meta-siltstones, calc-silicate, gneiss, amphibolite and serpentinised ultramafic rocks. The major rock units consist of the Precambrian Argentine Metamorphics, Carboniferous Oweenee granite, the Late Carboniferous–Early Permian intrusive rhyolites and breccias and Tertiary sediment and duricrust cover. Tertiary sediments, laterite and Quaternary alluvium underly the majority of the Project area.

The Dingo Dam deposit consists of a laterised serpentinite body occurring as a distinct low-lying feature with sub-surface units characterised by siliceous honeycomb textured rocks. The body contains scattered sub-crop and outcrops of silica-geothite laterite zones forming hard, resistant, smooth weathered areas. The Project site comprises a hard layer of soil or duricrust composed predominantly of silica, iron, calcium and gypsum. Weathering has removed the original duricrust that once connected the deposit with the surrounding laterite. Mineralisation is generally restricted to the top 30 m of the weathered profile. Red brown soils are well developed over areas of lateritic outcrop and sub crop and are generally covered with colluvial scree.

3.1.5 Topography and surface hydrology

The Project area is characterised by generally gentle slopes (average 2–3%) with overland flow paths becoming channelised in the steeper upstream areas and, in some case, transecting the Project site which borders the alluvial floodplain in the north. The highest elevation on the Dingo Dam site is RL 365.5 m at the south-western extent of ML 10324, with the lowest elevation being RL 336.0 m in the north-eastern extent.

The Project is situated within Basalt River sub-catchment of the Upper Burdekin River Basin (Figure 7) located approximately 28 km from the Burdekin River channel, and approximately 230 km from the confluence of the Burdekin River with Dalrymple Lake (Burdekin Falls Dam). From the Burdekin Falls Dam, the Burdekin River flows approximately 160 km to the Coral Sea. The Burdekin River falls about 620 m over its approximate 886 km length. The Burdekin River catchment covers a total area of approximately 130,000 km² and has peak flows from December to April and lower flow from May to November.

The Dingo Dam ML is drained via unnamed first, second and third order drainage features that drain to a sandy, ephemeral fifth order watercourse known as Snake Creek. Snake Creek ranges from 10–30 m wide,

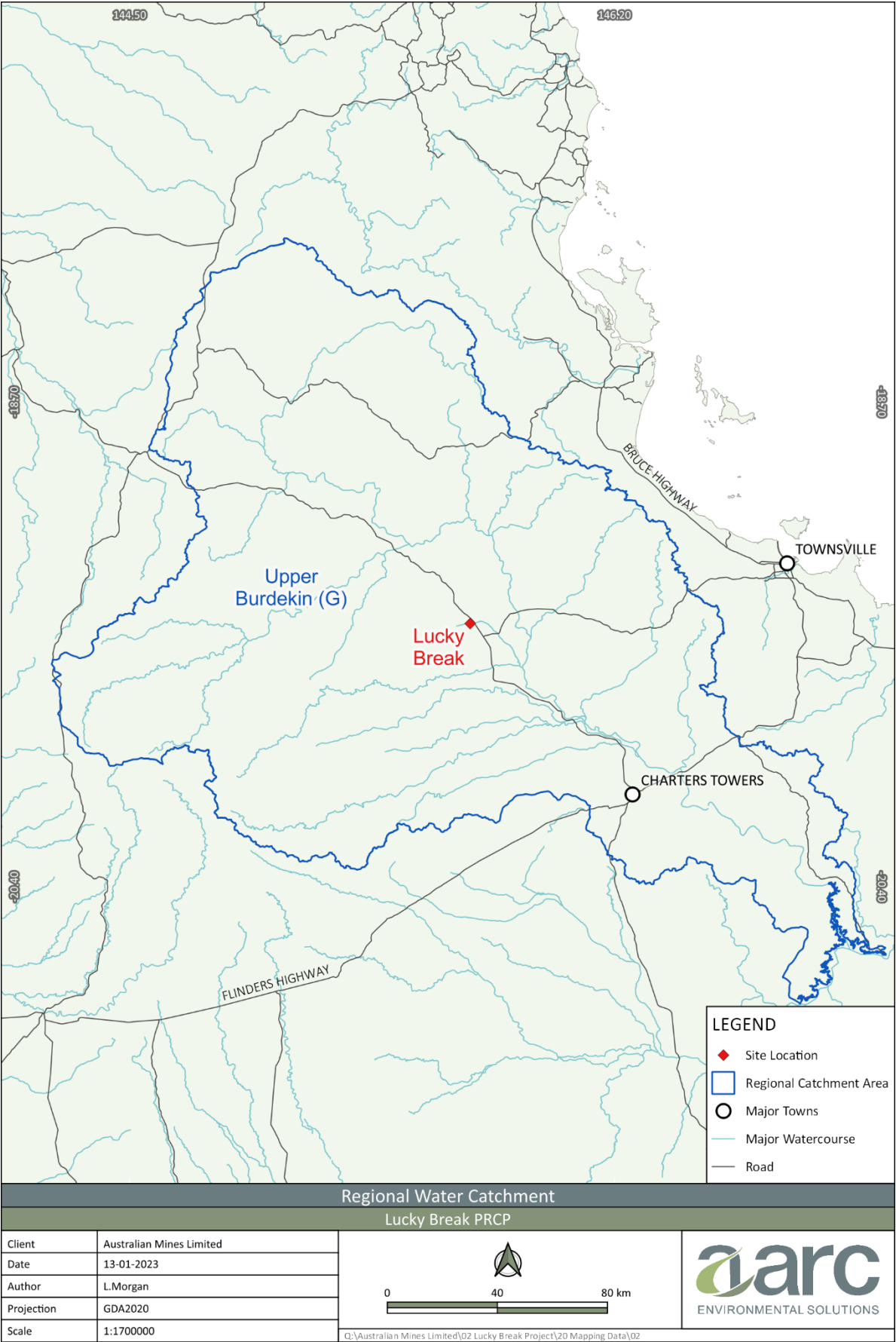


Figure 7: Regional catchments

with a bed consisting of coarse sand. Snake Creek drains into Stockyard Creek (a 6th order watercourse), which flows southeast into the Basalt River, shortly before reaching the Burdekin River. The immediate receiving environment (within 5 km of the Project) is situated in the lower reaches of the Basalt River sub-catchment; a sub-catchment which then flows to the Burdekin River (Blue Range) sub-catchment. Local watercourses occurring within and surrounding the Project are shown in Figure 8.

3.1.6 Groundwater

Exploration drilling has indicated that groundwater resources for the Project are located at depths in excess of 50-60 mbgl, which is well below the maximum depth of extraction (GeoSquare 2019). The gently undulating topography of the site suggests that groundwater depth would have a similar pattern over the remainder of the site (AARC 2007).

Exploration has not been undertaken below 36 m, so the standing groundwater level is unknown. However, the Lucky Break area is known to have poor groundwater resources and groundwater is typically difficult to find. A bore used by the landowner for potable water purposes draws water from a depth of approximately 80 m at a distance of 1.5 km south-west of the Project site. The known geology of the region indicates that there is no fracturing between the surface and the depth of groundwater in which the bore is located (AARC 2007).

Groundwater from the homestead potable water bore was sampled and analysed in 2006 prior to the commencement of mining. At the time, the results indicated that water quality was good due to low salinity, neutral pH and most metals being below detection limits or low in concentration. All metals apart from arsenic were below the Australian Drinking Water Guidelines (2004). The Australian standard for arsenic in drinking water is 0.007 mg/L and the World Health Organization standard is 0.01 mg/L. Samples obtained in August 2006 were below this standard, however, samples obtained a month prior recorded arsenic levels of 0.011 mg/L within the homestead bore.

It is understood that no groundwater monitoring bores were installed prior to, during or since the cessation of mining. The two samples collected from the homestead bore in 2006 provide the only known groundwater quality data representing baseline conditions relevant to the Project.

Groundwater from the homestead potable water bore was sampled and analysed in July and August of 2006, prior to the commencement of mining. The results indicated that water quality was good at the time, being characterised by low salinity, neutral pH, and most metal concentrations, except arsenic, copper and zinc, were either below detection limits or at low concentrations. All dissolved metal concentrations, except for arsenic sampled in July 2006 (0.011 mg/L), were within the limits set by the current Australian Drinking Water Guidelines (ADWG) (NHMRC 2011). No groundwater quality monitoring is known to have occurred during the Project's operational phase. However, groundwater quality samples collected and analysed since March 2022 (post-mining) have shown a marked decline from the historically elevated metal concentrations (e.g., arsenic, copper, and zinc) across all three sampling events. This timeline of water quality markers indicates that groundwater quality has improved over time and that the mining activity has had no influence on the known groundwater resource at Lucky Break.

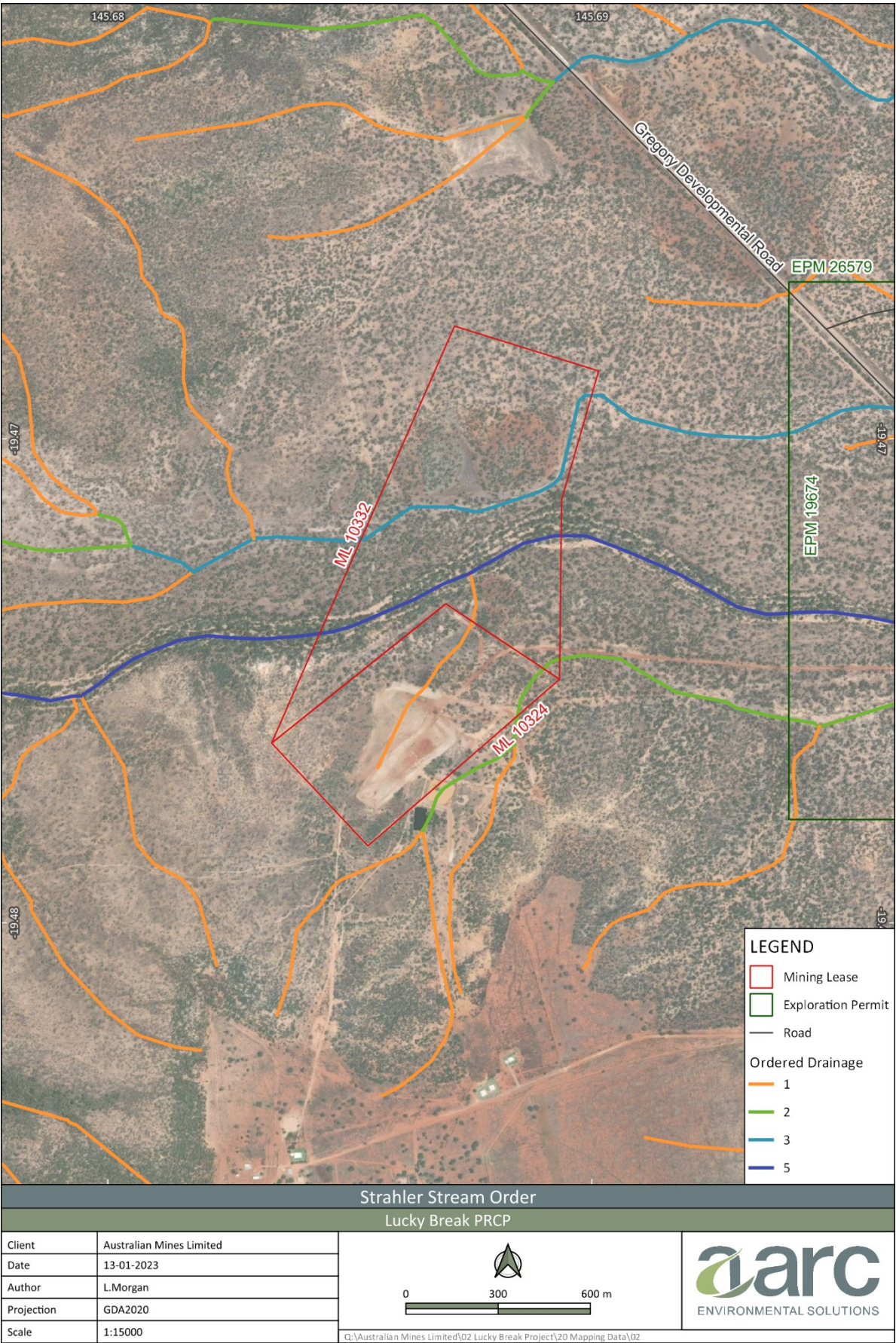


Figure 8: Local watercourses by Strahler stream order (pre-mining)

3.1.7 Land and soil

Both MLs are located on the single property, Lot 1 on Plan OC57. Spyglass Beef Research Station (Department of Agriculture and Fisheries) is currently the landholder as well as the existing user of the land. Dingo Dam is a pre-existing structure and owned by the landholder. The final land uses and rehabilitation responsibilities of both MLs have been negotiated and agreed with the landholder.

Spyglass Beef Research is a research facility, researching tropical and subtropical beef production and ecosystem management. The facility provides livestock and research facilities to the Department of Agriculture and Fisheries and other organisations.

There are currently no existing approved resource tenements immediately surrounding the Project, however, three mineral exploration permits have been granted locally and are summarised in Table 6 and shown on Figure 9.

The study area is within the boundaries of the Gudjala People Native Title Claim (QUD80/05) and a voluntary Cultural Heritage Management Plan was prepared prior to mining.

Table 6: Resource tenements immediately proximate to the Project

Tenement holder	Tenement	Permit name	Granted date	Expiry date	Proximity to the Project
Sconi Mining Operations Pty Ltd	EPM 26579	Dingo Dam Extension	18 th April 2018	17 th April 2023	Overlaps the Project
Graham Exploration Pty Ltd	EPM 19674	-	18 th December 2013	17 th December 2023	To the east of the Project and overlaps Lot 10C57
	EPM 19271	-	5 th March 2013	4 th March 2023 (expired)	To the west of the Project and overlaps Lot 10C57

The Project area has been historically subject to low intensity cattle grazing, horse grazing and mineral exploration. Dominant regional land uses in the Upper Burdekin catchment are grazing on natural pastures (88%) and conservation areas (11%) (NQ Dry Tropics 2016).

Four soil types are found within the Project area including Barkla, Cape, Conolly and Corea. The Barkla and Cape associations - soils formed on alluvial plains - are the dominant soil type for the Project and cover approximately 63% and 28% respectively of the ML areas (Figure 10). The Cape association is found on the lower plains around Snake Creek and the Barkla association is found on the slightly higher alluvial plains. Conolly soils are limited to the western edge of ML 10324 and Corea soil forms three lateritic clay outcrops, two of which are the protruding ore bodies.

Soils of the Project are classified as a Land Suitability Class 4 for beef cattle grazing, soils that are marginally suitable for cattle grazing with major inputs required to ensure sustainable use (AARC 2006a). It should be noted, however, that low intensity grazing is the current land use for this area. There are no significant signs that the current use for grazing of this land is unsustainable. Successful cattle grazing has been undertaken within the Project site during periods of favourable climatic conditions.

Three of the four soil types present on the Project site have been assessed as Class 5 Land Suitability for rainfed broadacre cropping, which is considered unsuitable for this land use (AARC 2007). The limiting factors are plant available water capacity, soil structure and topography. The remaining soil type, the Cape association, has been assessed as Land Suitability Class 3 for rainfed broadacre cropping, which is considered moderate to marginal for this land use.

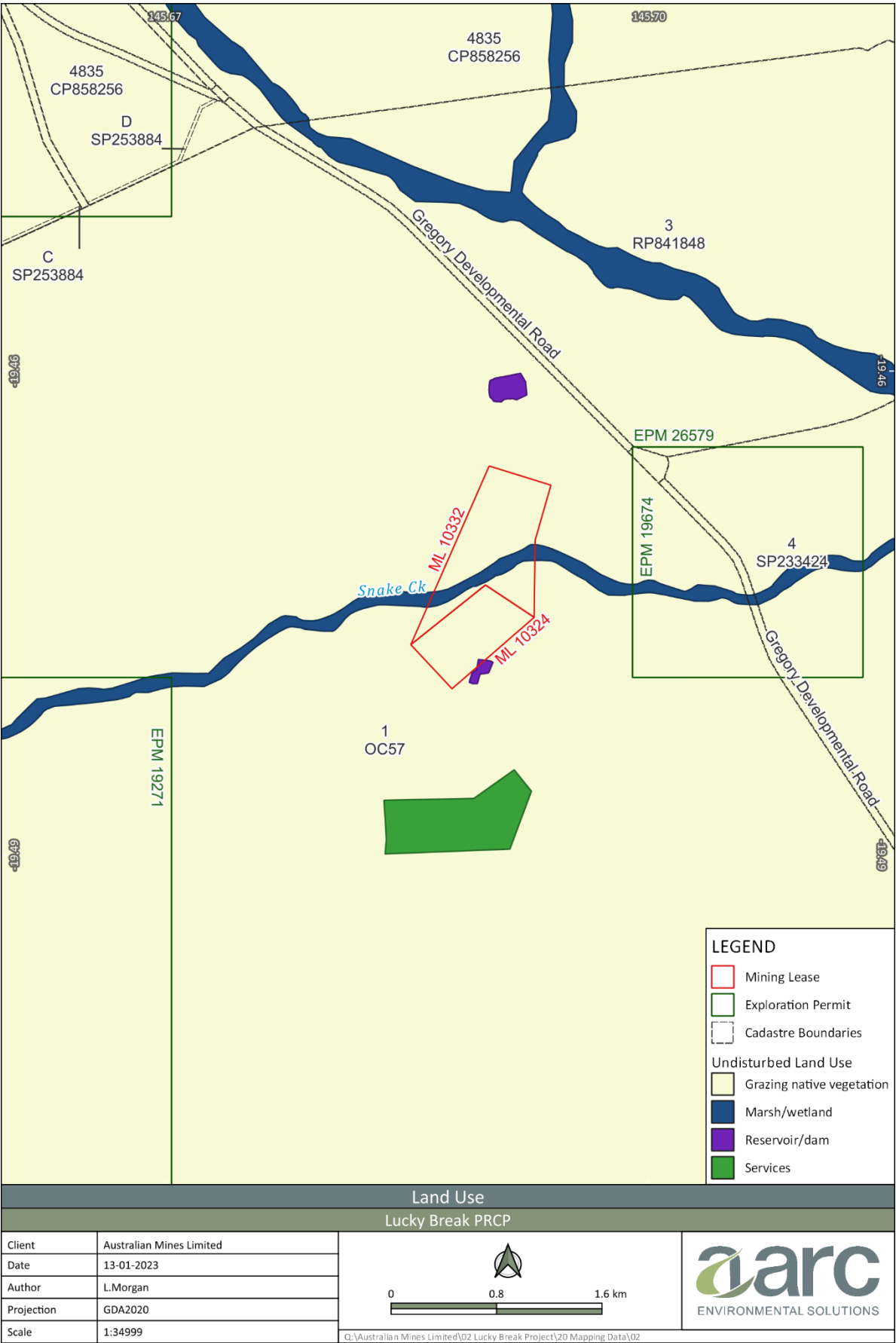


Figure 9: Local land use

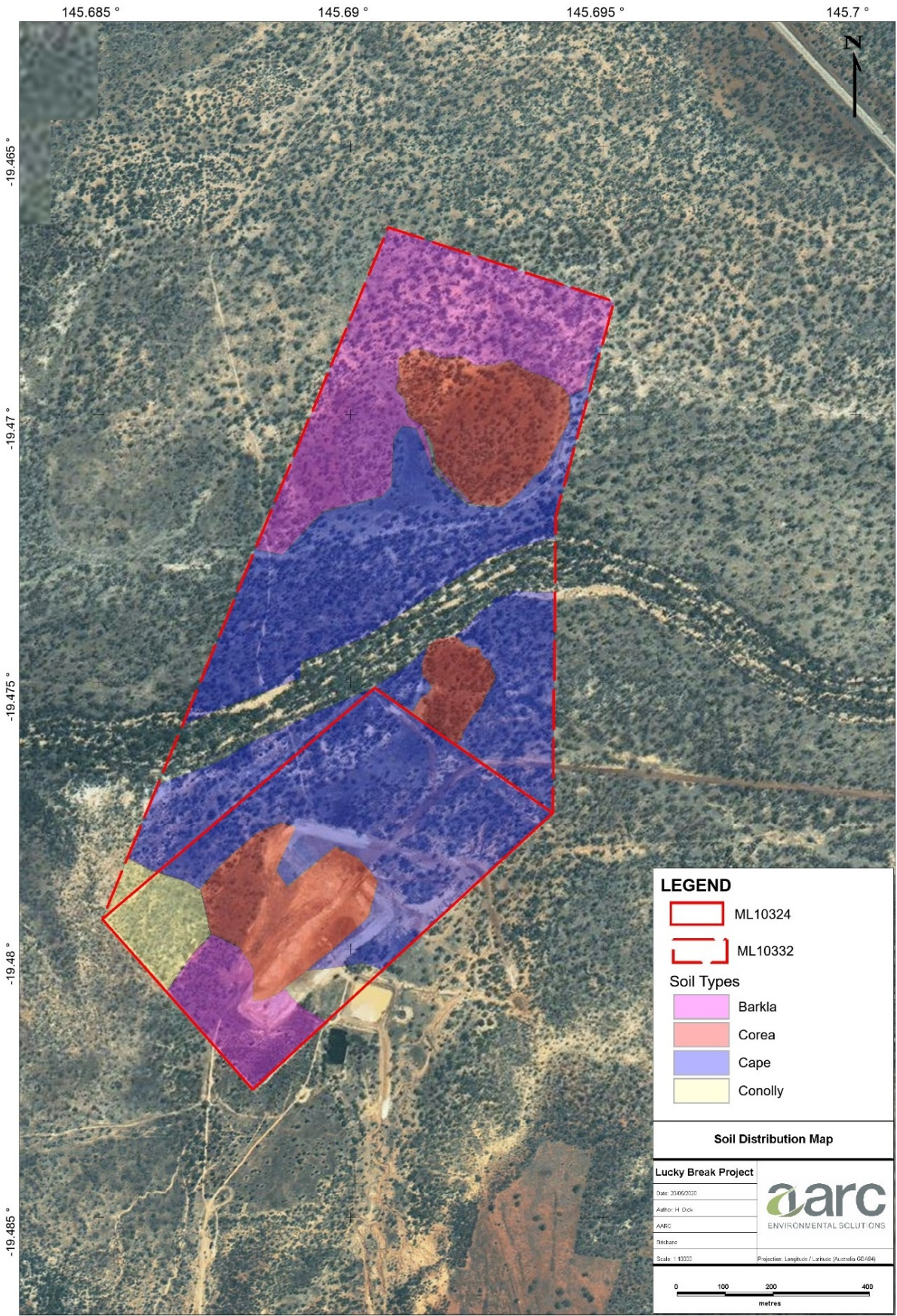


Figure 10: Soils of the Project

3.1.8 Flora and fauna

3.1.8.1 Pre-mining vegetation

A terrestrial ecology survey of the Project was undertaken between 10–16 July 2006 (AARC 2006b). Targeted surveys were also undertaken during this period for potential species of conservation significance.

Three distinct vegetation communities were identified during the survey, with five corresponding regional ecosystems (REs). The three vegetation communities include:

- Community 1—River Red Gum Riparian Woodland (RE 9.3.1);
- Community 2—Narrow Leaved Ironbark Woodland (RE 9.3.22); and
- Community 3—Silver Leaved Ironbark Woodland (RE 9.12.4a).

All REs described within the Project area are listed as being ‘not of concern’ under Queensland’s *Vegetation Management Act 1999*. They are not listed as ‘threatened’ under the Commonwealth’s *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Two of the REs have a biodiversity status listed as ‘of concern’ but are either not generally proximate to disturbance zones or have limited distribution in the Project area. Consequently, disturbance of these REs is understood to have been limited.

The dominant species identified within each community and the corresponding RE’s are described in Table 7.

No listed flora species were identified during the targeted surveys.

The Rubber Vine (*Cryptostegia grandiflora*), a declared pest and Weed of National Significance was recorded along Snake Creek riparian zone, adjacent to the Project site.

Table 7: Pre-mining vegetation community summary

Community	Regional ecosystem (RE)	Short description	Site observations
Community 1— River Red Gum Riparian Woodland	9.3.1	<i>Eucalyptus camaldulensis</i> and/or <i>E. tereticornis</i> +/- <i>Melaleuca</i> spp. +/- <i>Casuarina cunninghamiana</i> fringing woodland on channels and levees	<u>Canopy</u> • <i>Eucalyptus camaldulensis</i> • <i>Casuarina cunninghamiana</i> • <i>Corymbia tessellaris</i> <u>Sub-canopy</u> • <i>Melaleuca fluviatilis</i> <u>Ground cover</u> • <i>Mitracarpus hirtus</i>¹ • <i>Lomandra longifolia</i> • <i>Cryptostegia grandiflora</i>¹ • <i>Chloris virgata</i> • <i>Crotalaria dissitiflora</i>; • <i>Heteropogon contortus</i> • <i>Setaria surgens</i> • <i>Sida cordifolia</i>¹ • <i>Sida subspicata</i>

Community	Regional ecosystem (RE)	Short description	Site observations
Community 2— Narrow Leaved Ironbark Woodland	9.5.3 / 9.5.11	<i>Eucalyptus crebra</i> or <i>E. drepanophylla</i> and <i>Corymbia clarksoniana</i> woodland on sand plains / <i>Eucalyptus persistens</i> +/- <i>E. crebra</i> woodland on flats on Tertiary remnant plains	RE 9.5.3 and RE 9.5.11 located on gentle slopes and laterite outcrops. RE 9.3.22 located on alluvial plains of Snake Creek.
	9.3.22	<i>Eucalyptus crebra</i> or <i>E. cullenii</i> +/- <i>Corymbia</i> spp. open woodland on alluvial levees and terraces	<u>Canopy</u> <i>Eucalyptus crebra</i> <i>Corymbia clarksoniana</i> <i>Corymbia erythrophloia</i> <i>Corymbia tessellaris</i> <u>Understorey</u> <i>Atalaya hemiglauc</i> <i>Carissa lanceolata</i> <i>Grevillea striata</i> <i>Hakea chordophylla</i> <u>Shrub</u> <i>Neptunia dimorphantha</i> <i>Sida spinosa</i>¹ <i>Sida cordifolia</i>¹ <u>Ground cover</u> <i>Aristida calycina</i> var. <i>calycina</i> <i>Eriachne ciliate</i> <i>Mitracarpus hirtus</i>¹ <i>Rhynchelytrum repens</i>¹
Community 3— Silver Leaved Ironbark Woodland	9.12.4a	<i>Eucalyptus shirleyi</i> and/or <i>E. melanophloia</i> and/or <i>Corymbia peltata</i> and/or <i>Callitris intratropica</i> low open woodland on igneous rocks	<u>Canopy</u> <i>Eucalyptus shirleyi</i> <i>Corymbia peltate</i> <u>Understorey</u> <i>Acacia disparrima</i> <u>Shrub</u> <i>Neptunia dimorphantha</i> <i>Sida spinosa</i> <i>Sida subspicata</i> <i>Sida cordifolia</i>¹ <i>Trema tomentosa</i> <u>Ground cover</u> <i>Heteropogon contortus</i> <i>Aristida calycina</i> var. <i>calycina</i> <i>Rhynchelytrum repens</i>¹

1. Introduced species

3.1.8.2 Pre-mining fauna observations

A total of 45 vertebrate fauna species were identified across the Project site during the July 2006 field survey; comprising of 31 birds, seven mammals (four introduced), five reptiles and two amphibians (one introduced). Species found within the Project site are listed in Table 8.

Many of the bird species observed were found using Dingo Dam, which is partially located within the southern boundary of the Project site. Only one bird species of conservation significance (at the time approvals were granted) was recorded during the survey. The Australian Cotton Pygmy Goose was observed in Dingo Dam. At the time Project approvals were granted, this species was listed as Rare under the Queensland *Nature Conservation Act 1992* and listed as migratory and marine-overfly under EPBC Act (AARC 2006b).

The pre-mining habitat values of the Project area are summarised as follows:

- Food sources for birds are restricted to seeds, nectar, insects and vertebrate prey items, with canopy structure within vegetation likely to support insectivorous birds.
- No 'important' habitat value has been identified for migratory birds.
- Ground vegetation, shrubs and grasses, provides habitat for small populations of small mammals.
- Habitat across the site is likely to support a low number of reptiles.

Table 8: Fauna species found on the Project site (AARC 2006b)

Common name	Scientific name
Migratory birds	
Australian Cotton Pygmy Goose	<i>Nettapus coromandelianus</i>
Cattle Egret	<i>Ardea ibis</i>
Magpie Goose	<i>Anseranas semipalmata</i>
Bird	
Rainbow Bee-eater	<i>Merops ornatus</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Darter	<i>Anhinga melanogaster</i>
Wedge-tailed Eagle	<i>Aquila audax</i>
White-face heron	<i>Ardea novaehollandiae</i>
White-necked Heron	<i>Ardea pacifica</i>
Australian Bustard	<i>Ardeotis australis</i>
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Galah	<i>Cacatua roseicapilla</i>
Australian Wood Duck	<i>Chenonetta jubata</i>
Torresian Crow	<i>Corvus orru</i>
Pied Butcherbird	<i>Cracticus nigrogularis</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>

Common name	Scientific name
Emu	<i>Dromaius novaehollandiae</i>
Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>
Peaceful Dove	<i>Geopelia placida</i>
Squatter Pigeon (Northern Race)	<i>Geophaps scripta peninsulae</i>
Magpie Lark	<i>Grallina cyanoleuca</i>
Australian Magpie	<i>Gymnorhina tibicen</i>
Black-winged Stilt	<i>Himantopus himantopus</i>
Noisy Miner	<i>Manorina melanocephala</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Striated Pardalote (Black headed race)	<i>Pardalotus striatus melanocephalus</i>
Little Friarbird	<i>Philemon citreogularis</i>
Noisy Friarbird	<i>Philemon corniculatus</i>
Yellow-billed Spoonbill	<i>Platelea flavipes</i>
Pale-headed Rosella	<i>Platycercus adscitus</i>
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
Apostlebird	<i>Struthidea cinerea</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Masked Lapwing	<i>Vanellus miles</i>
Reptiles	
Skink	<i>Carlia foliorum</i>
Spalding's Ctenotus	<i>Ctenotus spaldingi</i>
Fat-tailed Gecko	<i>Diplodactylus conspicillatus</i>
Bynoe's Gecko	<i>Heteronotia binoei</i>
Fire-tailed Skink	<i>Morethia taeniopleura</i>
Amphibians	
Cane toad	<i>Bufo marinus</i>
Ornate Burrowing Frog	<i>Limnodynastes ornatus</i>
Mammals	
Dingo/Wild Dog	<i>Canis lupus</i>
Cat	<i>Felis catus</i>
Eastern Grey Kangaroo	<i>Macropus giganteus</i>

Common name	Scientific name
Common Wallaroo	<i>Macropus rubustus</i>
European Rabbit	<i>Oryctolagus cuniculus</i>
Pig	<i>Sus scrofa</i>
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>
Common Brushtail Possum	<i>Trichosurus caninus</i>

3.1.8.3 Remnant vegetation

A desktop search of version 12.2 of the Queensland Government vegetation management regional ecosystem mapping (DES 2021b) identified five REs within the Project; these are listed in Table 9. The distribution of each RE is shown on Figure 13. It is noted that the distribution and type of RE mapped on the remnant vegetation map (Figure 12) differs from that reported in historic reports (Figure 11).

The Project is dominated by RE 9.3.22a, with RE 9.3.1 associated along Snake Creek. RE 9.12.1c is located on the south-western corner of the Project area. RE 9.5.3 / 9.4.2 is mapped in the north of the Lucky Break ML, and while RE 9.4.2 is listed as 'of concern' under the *Vegetation Management Act 1999*, disturbance on the Lucky Break ML was limited to exploration activities. The area around Dingo Dam is mapped as non-remnant vegetation.

Table 9: Remnant regional ecosystems within the Project

Regional ecosystem (RE)	Short description	Conservation status (<i>Vegetation Management Act 1999</i>)
9.3.22a	<i>Eucalyptus crebra</i> or <i>E. cullenii</i> +/- <i>Corymbia</i> spp. open woodland on alluvial levees and terraces	Least concern
9.3.1	<i>Eucalyptus camaldulensis</i> and/or <i>E. tereticornis</i> +/- <i>Melaleuca</i> spp. +/- <i>Casuarina cunninghamiana</i> fringing woodland on channels and levees	Least concern
9.12.1c	<i>Eucalyptus crebra</i> and/or <i>E. xanthoclada</i> and/or <i>E. drepanophylla</i> low open woodland on igneous rocks	Least concern
9.5.3 / 9.4.2	<i>Eucalyptus crebra</i> or <i>E. drepanophylla</i> and <i>Corymbia clarksoniana</i> woodland on sand plains / <i>Eucalyptus persistens</i> or <i>E. brownii</i> open woodland with a shrub layer of <i>Eremophila mitchellii</i> , <i>Psyrax oleifolia</i> , <i>Flindersia maculosa</i> and <i>Lysiphyllum</i> spp. on clay lenses in Cainozoic plains	Least concern/of concern



Figure 11: Pre-mining distribution of vegetation communities

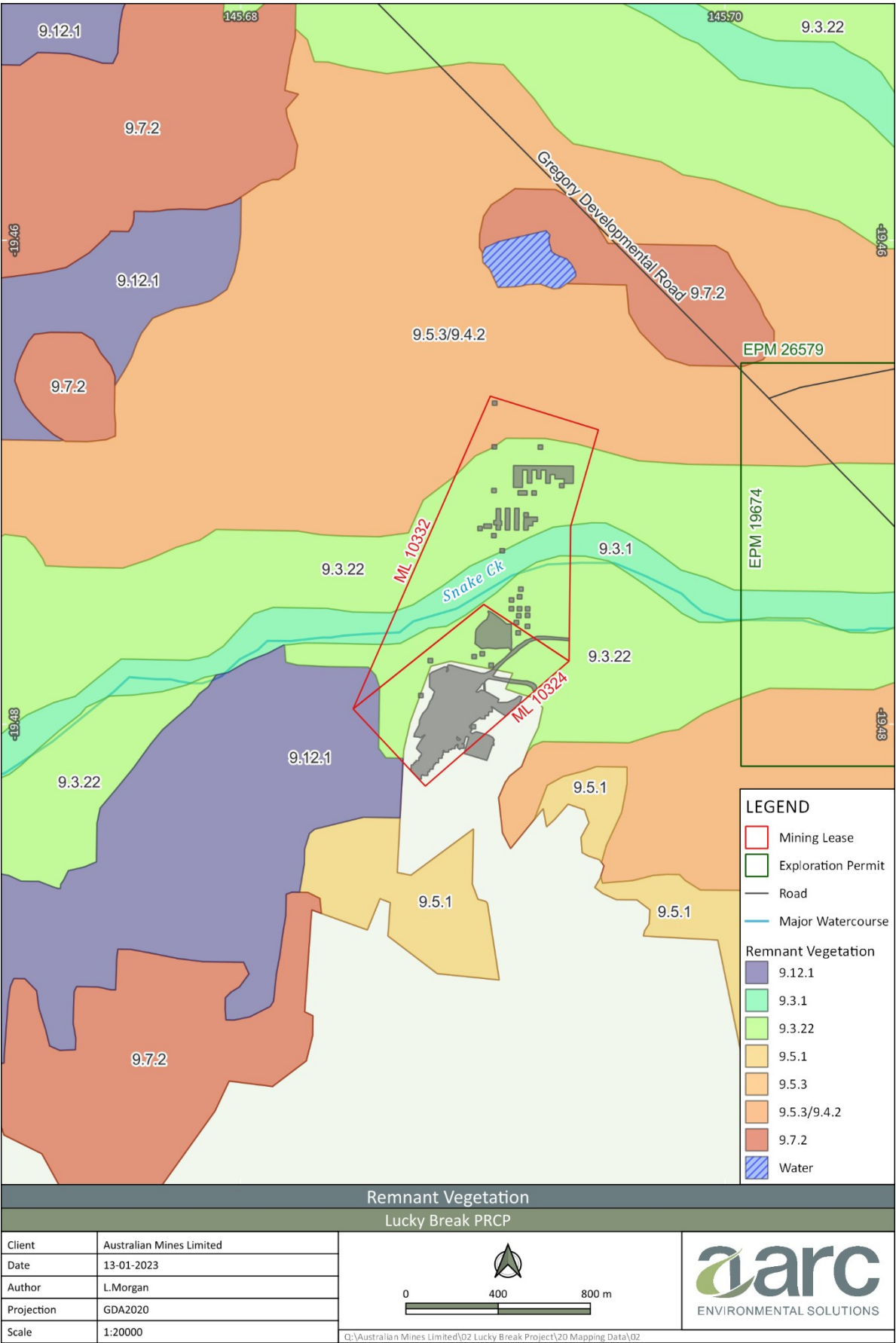


Figure 12: Remnant vegetation

3.2 Community consultation

3.2.1 Previous stakeholder and community engagement activities

Information relating to stakeholder engagement undertaken by the previous EA holder pertaining to the PMLU, prior to the acquisition of the Project by AUZ is limited. AUZ is committed to their responsibilities under the EP Act and will continue to engage with relevant stakeholders as outlined in section 3.2.2, to satisfy the requirements of section 126C(1)(c) of the EP Act.

Rehabilitation methodologies and post-mining land outcomes have remained unchanged throughout the Projects operation and since the cessation of mining activities. For the period that AUZ has held the MLs, there has been direct, ongoing dialogue between the landowner and AUZ to keep them informed and engaged in the Project rehabilitation outcomes.

A summary of stakeholder engagement that has been undertaken throughout the life of the Project, including that pre-dating AUZ acquisition of the Project, is provided in Table 10.

3.2.2 Ongoing stakeholder engagement

The Project is located in an area with limited population and given that the Project is in the end stages of closure, the current, ongoing and direct dialogue with the landholder is considered appropriate.

Additionally, given that the Project is in care and maintenance, future consultation is anticipated to be limited to actions such as responding to stakeholder inquiries and providing information on rehabilitation progress, where appropriate. Consultation methods primarily include email and phone for inquiries and complaints. All site visits and any site works are required to comply with Spyglass entry and induction requirements; this process in itself engenders conversations as to rehabilitation progress and site works.

Ongoing monitoring of the local environment is a requirement in the EA conditions for the Project. Results of regular monitoring events will be made available to interested and affected persons when requested. A community consultation register has been developed and is attached in Appendix C and is used to record ongoing consultation date(s), engaged community member(s), consultation type, information provided, key issues raised, response actions and/or outcomes and any commitments made by the Project. All complaints received will also be included in the community consultation register.

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Table 10: Summary of past community consultation

Consultation date	Community members	Consultation type	Information supplied	Issues raised and discussed	Response and outcome
22 December 2005	Landowners Lot 1 on RPOC57	Letter	-	Compensation and licence agreement for MLA 10324	Compensation and Licence Agreement signed.
17 August 2006	Gudjala People	Face to face meeting		Cultural heritage issues and cultural heritage field survey.	
13 September 2007	Mining registrar	Landowners Lot 1 on RPOC57	Copy of the Compensation and licence agreement for Lot 1 on RPOC57.	Compensation and licence agreement lodgement following approval of the mining lease.	-
3 December 2014	Spyglass Beef Research facility (Landowners)	Letter	-	Landholder agreement for retained infrastructures	-
3 December 2014	Department of Agriculture and fisheries (Landowners)	Deed	-	Land Access Deed	Land access and deed agreed and signed.
16 April 2015	Department of Environment and Heritage Protection	Memorandum	-	Site visit undertaken on the 6 August 2014. Concerns raised with regards to lack of sediment dam.	Follow-up site investigation undertaken on the 15 July 2015.
15 July 2015	Department of Environment and Heritage Protection and Spyglass beef research station	Site inspection and face-face meeting	-	Rehabilitation works undertaken and responsibilities.	-
20 May 2016	Department of Environment and Heritage Protection	Letter	-	Concerns raised following a compliance site inspection on the 20 April 2016. Concerns related to total aluminium concentrations in the void.	Response submitted to the Department. Further monitoring to be undertaken, stock access to the pit was prevented. Manager of Spyglass Beef Research facility

Consultation date	Community members	Consultation type	Information supplied	Issues raised and discussed	Response and outcome
					was notified of aluminium content and that cattle will be excluded from the pit. Additional rehabilitation methods proposed to be implemented.
9 March 2018	Department of Environment and Science	Permit	-	-	EA permit issued to Sconi Mining Operations Pty Ltd.
1 November 2018–15 November 2018	Department of Environment and Science	Letter correspondence	Information response to outcomes of a compliance inspection.	Compliance concerns	Letter received on 20 November indicating that the information responses received were adequate and no further action was required.
November 2018	Department of Environment and Science	Pre-lodgement Face-face meeting	Presentation on the Project Background, outcomes of recent site investigations and proposed EA amendment outline.	Proposed EA amendments to reflect low potential for environmental harm and status of the operations i.e., care and maintenance.	-
13 and 14 December 2018	Spyglass beef research station	Telephone and email	-	Water management strategy for Dingo Dam and rehabilitation requirements.	-
18 December 2018 – 8 January 2019	Spyglass beef research station	Email	-	Topsoil requirements and construction of a viable dam.	-
September 2019	Department of Environment and Science	Pre-lodgement Face-face meeting	Presentation on the Project Background, outcomes of recent site investigations, proposed EA amendments and ERC review.	Proposed EA amendments to reflect low potential for environmental harm and status of the operations i.e., care and maintenance.	-
23 December 2019	Spyglass beef research station	Landholder statement	-	-	-
26 October 2020	Department of Environment and Science	Permit	-	-	Minor EA amendment approved and updated EA issued.

Consultation date	Community members	Consultation type	Information supplied	Issues raised and discussed	Response and outcome
24 March – 29 April 2022	Department of Environment and Science	Email / Letter	Information relating to the potential release incident on the 24 March 2022.	Potential release following heavy rainfall in January and February.	Investigation following potential release undertaken and investigation report submitted to the department on the 29 April.
10 May 2022	Department of Environment and Science	Email and telephone	-	Potential release event in January / February 2022. Review of compliance with the EA monitoring requirements to be undertaken.	
11 May 2022	Department of Environment and Science	Email	Release event notification and circumstances surrounding the event.	Overtopping of the final void on the 10 th of May 2022, releasing to the receiving environment.	Release inspection report undertaken.
7 September 2022	Department of Environment and Science	Letter	-	Potential non-compliance with EA following site inspections in May and August 2022. Potential unmonitored release event.	Follow-up review of receiving environment water quality.
21 September 2022	Department of Environment and Science	Letter	-	Potential non-compliance with EA following site inspections in May and August 2022.	Response prepared to the department, addressing planned rehabilitation works to undertake concerns raised progress limited by weather and COVID-19 border restrictions. Concerns regarding release events addressed with regards to investigation reports undertaken. Stormwater management works planned to occur as soon as conditions are amenable to occur. Temporary works undertaken prior to the wet season in the interim.

Consultation date	Community members	Consultation type	Information supplied	Issues raised and discussed	Response and outcome
12 October 2022	Department of Environment and Science	Letter	-	Warning letter issued re potential breach of EA conditions following site inspections in May and August 2022, taking into consideration of ongoing correspondence being undertaken.	Erosion and sediment control works undertaken prior to the wet season. Permanent works as proposed in the stormwater management plan to be undertaken following when conditions allow.
26 October 2022	Spyglass Beef Station	Phone	-	Stormwater management plan and implications on existing erosion	Stormwater feature 1 moved to within the mining lease boundary, discharging to an un-eroded surface.
12 December 2022	Department of Environment and Science	Email correspondence	Remedial earthworks undertaken.	Remedial earthworks to re-establish clean water diversion measures between the Dingo Dam and the Final void have been undertaken at the Lucky Break Mining Lease in preparation for the upcoming wet season.	-
30 January 2023	Spyglass Beef Station	Phone	-	Current performance of the stormwater management works undertaken so far. Preferred seeding mix to be used on-site.	Spyglass agronomist to be consulted on preferred seed mix.

Note: participants names have been excluded from this summary.

3.3 Post-mining land use

This section of the PRCP describes and discusses the PMLUs proposed for the Project in accordance with section 126C(1)(d) of the EP Act.

3.3.1 Land outcome documents

Schedule C and Table C1–Rehabilitation Requirements of the Project EA, identify the various disturbance types associated with the Project. In accordance with condition C4, a Post Mine Land Use Plan (PMLUP) has been developed for the Project and was submitted to the administering authority on 3 July 2020. The PMLUP identifies the PMLU for each disturbance area and complies with the legislated definition of a land outcome document (LOD). As such, under 750 of the EP Act, the PMLUP is considered to clearly define the transitional land outcomes.

By virtue of the existence of a suitable LOD, and in accordance with section 213 of the EP Regulation, Schedule 8A, part 3, Table 1-Final site design assessment and Table 2-Post-mining land use assessment – rehabilitation milestones do not apply to the objective assessment to be undertaken for the PRCP. In relation to the progressive rehabilitation component of Table 2, this PRCP will:

- describe how rehabilitation areas are planned in a way that achieves progressive rehabilitation;
- illustrate how progressive rehabilitation has already commenced at the Project;
- identify risks and discuss their incorporation within the milestone schedule; and
- describe community consultation approaches appropriate for the Project.

3.3.2 Proposed post-mining land uses

3.3.2.1 Prescribed post mining land use

In accordance with condition C1 of the EA:

Land disturbed by mining must be rehabilitated in accordance with Table C1-Rehabilitation Requirements

Table C1-Rehabilitation Requirements of the Project EA has been reproduced in Table 11 below. The proposed PMLUs for the Project have been described in Table 4 of the PMLUP, which is reproduced in Table 12.

Table 11: *Rehabilitation requirements in accordance with the Project EA (Schedule C, Table C1- Rehabilitation Requirements*

Mine domain and tenure	Mine feature name	Rehabilitation goal	Rehabilitation objectives	Indicators	Completion criteria
Dams ML 10324 ML 10332 ¹	Sediment dam 1 Sediment dam 2 ¹	All land subject to mining activities must be rehabilitated to meet the requirements of the administering authority guideline for Rehabilitation	To be provided in the PMLUP in accordance with Condition C4	To be provided in the PMLUP in accordance with Condition C4	To be provided in the PMLUP in accordance with Condition C4
Waste ML 10324 ML 10332 ¹	Overburden Dumps				
Run of Mine ML 10324 ML 10332 ¹	ROM pad Low grade ore stockpiles				

Mine domain and tenure	Mine feature name	Rehabilitation goal	Rehabilitation objectives	Indicators	Completion criteria
Ancillary Infrastructure ML 10324 ML 10332	Workshop Office Fuel storage Roads & Tracks Diesel Backup	of Mining Projects and must be defined in the Post Mine Land Use Plan (PMLUP).			
Voids ML 10324 ML 10332 ¹	Circular Laterite Pit ¹ Dingo Dam Pit				
Exploration ML 10324 ML 10332	Circular Laterite South-East Extension				
Mining area ML 10324 ML 10332 ¹	Topsoil Dumps				
Services ML 10332 ¹	Waste Disposal Trench				

1. Note that mining activities on ML 10332 (Lucky Break) were limited to exploration activities only. Items marked with a superscript 1 are activities that were approved but not undertaken. This table from the EA is reproduced here to illustrate the link between the EA and the LOD. This table was updated in the PMLUP to reflect the actual activities undertaken is reproduced in this PRCP as Table 12.

Table 12: Post mining land uses (reproduced from Table 4 of the PMLUP)

Project area	Pre-mining land use	Post-mining land use
Infrastructure areas		
Office area	Grazing/native ecosystem	Grazing/native ecosystem
Diversion bunds	Grazing/native ecosystem	Grazing/native ecosystem
Haul road	Grazing/native ecosystem	Grazing/native ecosystem
Stormwater management features	Grazing/native ecosystem	Grazing/native ecosystem
Waste		
WRD	Grazing/native ecosystem	Grazing/native ecosystem
Run of Mine (ROM)		
ROM pad	Grazing/native ecosystem	Grazing/native ecosystem
Voids		
Final void	Grazing/native ecosystem	Non-use management area
Dams		
Sediment dam	Grazing/native ecosystem	Grazing/native ecosystem
Dingo Dam ¹	Water Storage	Water storage

1: Dingo Dam is a pre-existing structure owned by the landowner.

3.3.2.2 Local planning instruments

The Project area is located wholly within the Charters Towers Regional Council local government area and is subject to the provisions of the Charters Towers Regional Town Plan (Town Plan) (Charters Towers Regional Council 2020). Lands underlying the Project have been zoned in the Town Plan as 'Rural' (Charters Towers Regional Council 2019). The Town Plan prescribes the following relevant outcomes of the Rural zone:

- (a) *areas for primary production are conserved and fragmentation is avoided through maintaining very large lots to support rural agricultural activities;*
- (b) *the viability of both existing and future rural uses and resource related activities are protected from the intrusion of incompatible uses;*
- (c) *sensitive land uses are protected from impacts associated with resource extraction activities associated with mining and quarrying having regard to vibration, odour, dust or other emissions;*
- (d) *the establishment of a wide range of rural pursuits is facilitated, including cropping, intensive horticulture, grazing, intensive animal industries, animal husbandry and animal keeping and other compatible primary production uses;*
- (e) *cropping and horticultural activities are encouraged on productive ALC Class A and B agricultural land;*
- (f) *renewable energy facilities and extractive industries:*
 - (i) *mitigate impacts on the environment and adjoining land uses;*
 - (ii) *do not degrade ALC Class A and B agricultural land;*
 - (iii) *are located to allow connections into supporting energy networks; and*
 - (iv) *rehabilitate sites upon completion of activities.*
- (g) *natural features such as creeks, gullies, waterways, wetlands and bushland are retained, managed and separated from adjacent development where possible. Any unavoidable impacts are minimised through location, design, operation and management requirements;*
- (h) *rural land uses incorporate sustainable practices to:*
 - (i) *prevent soil erosion and landslide;*
 - (ii) *protect the quality of land resources and water catchments; and*
 - (iii) *maintain habitat values of waterways and native timber and forest areas.*
- (i) *adverse impacts of land use, both on-site and from adjoining areas, are avoided and any unavoidable impacts are minimised through location, design, operation and management; urban and rural residential expansion does not occur on land in the rural zone.*

The proposed PMLUs for the Project are appropriate to both the outcomes specific to Rural land and to the overarching outcomes of the planning scheme goal provided in section 3.6 of the Town Plan, *A New World Protecting our heritage and natural resources*.

The Project is also located within the area covered the North Queensland Regional Plan (DSDMIP 2020). The North Queensland Regional Plan is a 25-year strategic, statutory planning document that encompasses the Charters Towers Regional Council area. Under the regional plan Snake Creek is mapped as a biodiversity corridor. Relevant goals and associated outcomes of the regional plan to the proposed PMLUs include:

- Goal 1: A leading economy in regional Australia; and

- Goal 2: A rich and healthy natural environment.

3.3.2.3 Proposed post mining land uses

In accordance with the existing land use, the authorised land uses and the local authority town plan, the PMLUP proposed that disturbance areas be returned to a low intensity grazing/native ecosystem land use, except for the final void and Dingo Dam as shown on Figure 13 and as outlined in Table 12.

For clarity, the PMLU for most rehabilitation areas has been amended to 'low intensity grazing'. The proposed PMLU is consistent with the Queensland Land Use Mapping Series (DES 2017), which describes land within the mining lease as having a use of 'grazing native vegetation'. However, it is noted that the overall outcome of the nominated PMLU remains consistent with the identified LOD.

The PMLU for two rehabilitation domains, the ROM pad and WRD, was also amended from 'low intensity grazing' to 'grassland' as agreed with the administering authority through the land court mediation process for the PRCP. This change was adopted in response to concerns raised about the ability of each landform to support a grazing PMLU.

These PMLU modifications consider the latest life-of-mine planning, latest research and guidelines, and account for any variations in areas or landform domains that are to be represented as a disturbance type. The amended PMLUs are shown in Table 13.

The intent for the vegetation community associated with the 'low intensity grazing' PMLU is to:

- incorporate ground cover species at a sufficient density to support grazing but not out-compete native vegetation species in the area;
- promote long-term stability; and
- to provide some of the ecosystem functions of native ecosystems of the region including:
 - habitat for ground-dwelling fauna;
 - food source for ground-dwelling fauna and birds; and
 - habitat connectivity.

Dingo Dam is a pre-existing dam owned by the landholder and only partly impinging on the ML. This structure will be retained and managed by the landholder as it was prior to the MLs being granted. The final land uses and rehabilitation responsibilities of both MLs have been agreed with the landholder, primarily through the original compensation agreement and recent consultation.

Results of the soils and land suitability assessment (AARC 2006a) indicated that the soils of the Project are classified as a Land Suitability Class 4 for cattle grazing, with the availability of water and nutrients as limiting factors. However, it is noted that successful cattle grazing has been undertaken within the Project site during periods of favourable climatic conditions.

The sustainable use of the Project area for beef cattle grazing will largely depend on appropriate stocking rates. Stocking rates will need to consider seasonal and annual variations in rainfall, availability of and appropriate management of water resources, the availability of land of similar quality in the immediate vicinity and implementation of appropriate management practices. It is expected that, as a beef research station, the rehabilitated areas will be appropriately managed.

Therefore, the final PMLUs proposed for the Project:

- are considered viable, having regard to the use of land in the surrounding region;
- are consistent with how the land was used before the mining activity was carried out on the land;
- are consistent with the uses of land permitted under local planning instruments; and
- will deliver, or aim to deliver, a beneficial environmental outcome that is acceptable to the local community.

Table 13: Proposed PMLU

Project area	Pre-mining land use	PMLU
Infrastructure areas		
Office area	Grazing native vegetation	Low intensity grazing
Diversion bunds	Grazing native vegetation	Low intensity grazing
Haul road	Grazing native vegetation	Low intensity grazing
Stormwater management features	Grazing native vegetation	Low intensity grazing
Waste		
WRD	Grazing native vegetation	Grassland
ROM		
ROM pad	Grazing native vegetation	Grassland
Voids		
Final void	Grazing native vegetation	Non-use management area
Dams		
Sediment dam	Grazing native vegetation	Low intensity grazing
Dingo Dam ¹	Water Storage	Water storage

1: Dingo Dam is a pre-existing structure owned by the landowner

3.4 Non-use management areas

3.4.1 Land outcome documents

The land outcome documents relevant to the Project are:

- the Project EA (EPML00900713); and
- the Post Mine Land Use Plan (AARC 2020a).

Schedule C and Table C1 – Rehabilitation Requirements of the Project EA, identify the various disturbance types of the Project. In accordance with condition C4 of the EA, a PMLUP has been developed for the Project and was submitted to the administering authority on 3rd July 2020. The PMLUP defines the location and extent of disturbance of a single final void (Figure 13) and states that:

It is intended that previously disturbed mine domains will largely be returned to a grazing/native ecosystem land use with the exception of the residual pit void. The residual pit void will have a final land use of a non-use management area (NUMA). At closure, the final void will meet the rehabilitation goals of being safe, non-polluting and stable.

By virtue of the existence of a suitable LOD outlining the NUMA for the Project, section 213 of the EP Regulation and Schedule 8A, part 3, Table 1 'Final site design assessment' and Table 3 'Non-use management area assessment – management milestones' do not apply to the objective assessment to be undertaken for the PRCP. In relation to the 'progressive improvement' component of Table 3, this PRCP will:

- describe how non-use areas will undergo improvement to a safe and stable condition post-closure;
- illustrate how improvement will commence at the Project;

- identify risks and discuss their incorporation within the improvement schedule; and
- detail the timeframe for IAs to progress through management milestones.

3.4.2 Proposed non-use management areas

The location and size of the NUMA described in the PMLUP (AARC 2020a) are consistent with the NUMA proposed for this PRCP (Figure 13). A single pit void with approximate dimensions of 400 m long, 80 m wide and 12–15 m below natural surface remains within ML 10324. The approximate footprint area of the pit void is 4.1 ha. The void floor lies at approximately RL 335 m to RL 338 m AHD. Rehabilitation of the final void included reducing pit batter angles to a typical slope of 20°, and a maximum of 22°.

Some previous documents referred to the final void remaining as a livestock watering source either by direct access or by pumping of entrained water to other nearby watering infrastructure.

Water quality data, including data from sampling triggered by overtopping events in 2018/19 and 2021/22 has been analysed and compared against EA trigger levels and contaminant limits. In some instances, water analyses have indicated concentrations of dissolved aluminium, chromium, cobalt, copper and nickel above the respective EA trigger levels. The only metal concentration exceedance noted in the downstream receiving environment following an overtopping event, and from subsequent follow-up sampling, was dissolved aluminium. Water quality results indicate total aluminium can occur at concentrations above the ANZECC (2000) guideline level for stock drinking water (5 mg/L) with values recorded in the range of 5.42 mg/L (February 2019) up to 14.9 mg/L (March 2022) prior to the completion of catchment modification earthworks.

Dissolved aluminium concentrations recorded at upstream sites on Snake Creek have also displayed elevated concentrations, suggesting that these levels are likely to be indicative of natural mineralisation in the region. The upstream stock water dam (Dingo Dam) has also been identified as a source of elevated concentrations of total aluminium.

The potential for elevated aluminium concentrations in the final void is considered to be the only impediment to the void being able to sustain a PMLU as a water storage. Given this, the void is intended to remain a NUMA, and the perimeter of the final void will remain separately fenced to ensure the landform remains safe for humans and animals.

With respect to the requirements of section 126C(d) of the EP Act, section 313.2 describes the previous and proposed engagement activities relevant to the Project. Past approval processes have been the primary vehicles for consultation associated with the current land use expectations for the Project.

As the NUMA proposed in this PRCP is consistent with the approved NUMA described in both LODs, it can be inferred that this is consistent with the outcomes of past consultation processes (undertaken as part of the EA and ML approvals).

Under section 754 of the EP Act, with the existence of a LOD that authorises the NUMA at the Project, this transitional PRCP is not required to comply with sections 126C(1)(g) and (h), and sections 126D (2) and (3). As such, no further justification of the NUMA is provided.

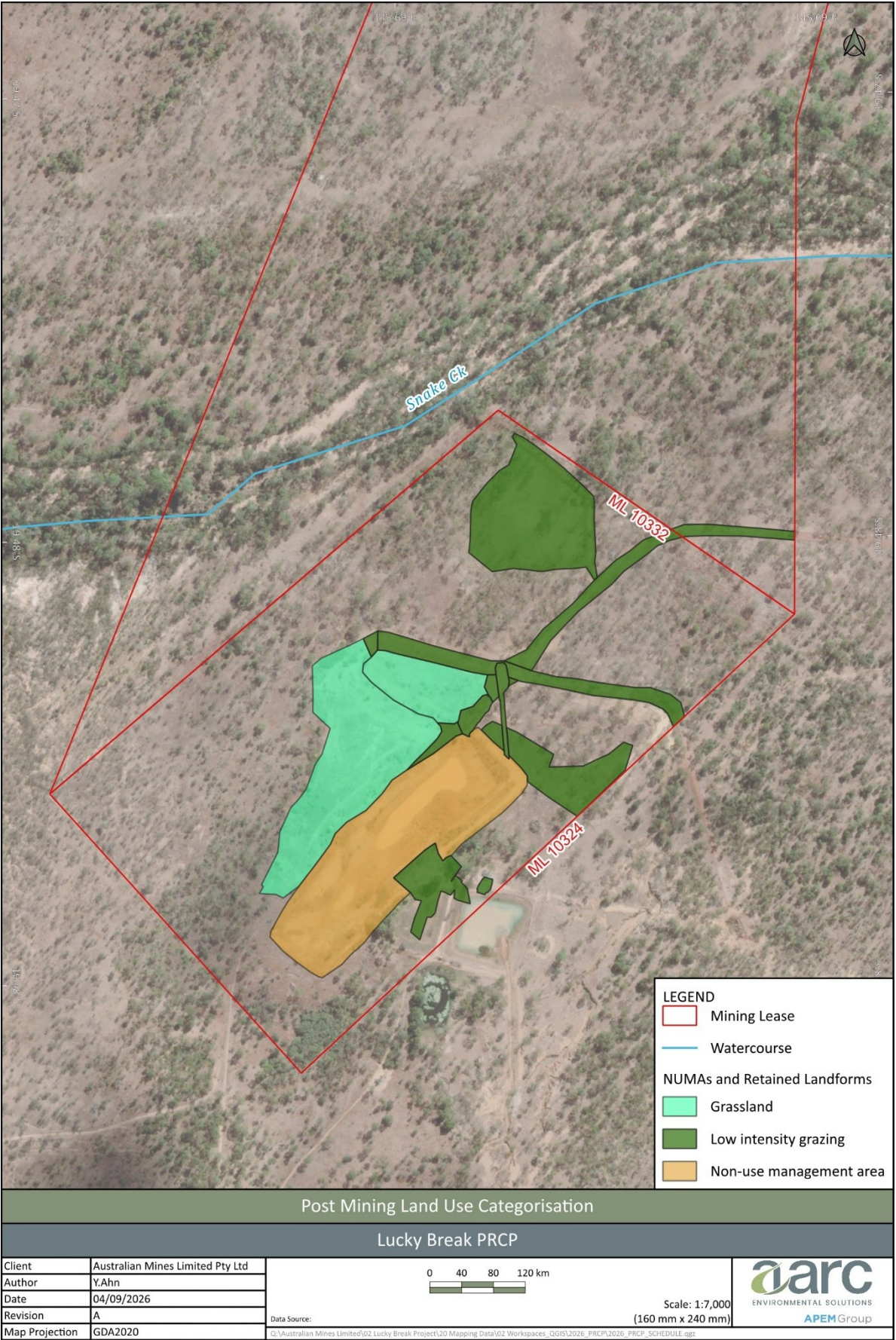


Figure 13: Project PMLUs and NUMA

3.5 Rehabilitation management methodology

3.5.1 Rehabilitation objectives

In Queensland, mine rehabilitation is required under the EP Act. Amendments to the EP Act in late 2018 implemented key elements of the State Government's Mined Land Rehabilitation Policy (Queensland Government 2018) which intends to ensure that, for land disturbed by mining activities:

- the land is safe and structurally stable;
- there is no environmental harm being caused by anything on or in the land; and
- the land can sustain a post-mining land use (section 111A of the EP Act).

These three objectives are the general rehabilitation goals for all areas disturbed by mining in Queensland.

The proposed PMLUs for the Project RAs are low intensity grazing and grassland. Rehabilitation activities have been, and will continue to be, conducted towards these outcomes. The majority of the Project site has been subject to active rehabilitation towards the nominated PMLUs and is considered close to achieving these PMLUs.

For the Project, the rehabilitation goals and objectives are summarised as follows:

- Long term safety:
 - the site is safe for humans and animals now and in the foreseeable future.
- Stable:
 - vegetation cover to minimise erosion; and
 - landforms certified as geotechnically stable.
- Sustainable land use:
 - soil properties that support and will continue to support the nominated PMLU; and
 - establishment of the specified self-sustaining natural vegetation or habitat.
- Non-polluting:
 - Hazardous material appropriately managed.

3.5.2 Rehabilitation areas and improvement areas

To allow the development of a PRCP schedule that satisfies the requirements of the PRCP Guideline, discrete rehabilitation areas (RAs) and improvement areas (IAs) have been defined for the Project. An RA is defined in the EP Regulation as an area of land in the PMLU to which a rehabilitation milestone for the post-mining use relates. An IA is defined in the EP Regulation as, for a NUMA, an area of land in the NUMA to which a management milestone for the NUMA relates. Either RAs or IAs have been nominated for areas of disturbance within the Project as shown on Figure 14 and listed in Table 14.

3.5.3 Rehabilitation milestones

The nominated rehabilitation milestones considered relevant to this stage of the Project are outlined in Table 15. Not all rehabilitation milestones are applicable to all RAs. The applicability of rehabilitation milestones to the various RAs is also shown in Table 15.

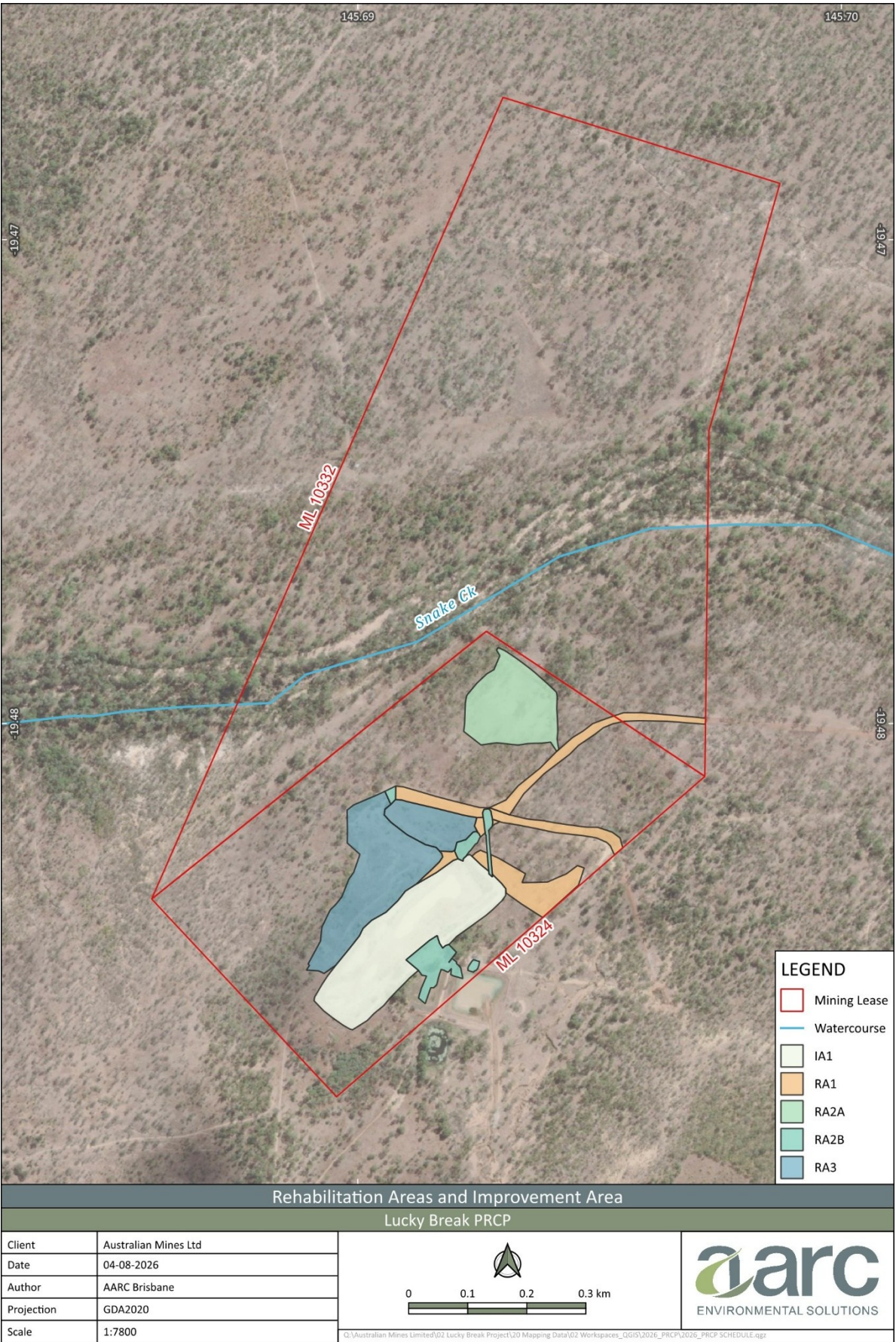


Figure 14: Rehabilitation and improvement areas reference map

Table 14: Nominated rehabilitation and improvement areas

Rehabilitation / Improvement area		Description
<i>Rehabilitation areas</i>		
RA1	Mine infrastructure area	- Office area - Haul road - Diversion bunds
RA2a	Water management infrastructure - sediment dam	Sediment dam
RA2b	Water management infrastructure - stormwater management system	Clean water drains
RA3	Waste rock dump & Run of mine pad	- WRD - ROM
<i>Improvement area</i>		
IA1	Final void	Residual void including highwalls.

Table 15: Milestones and their applicability to nominated RAs

Milestone reference	Description	Applicability			
		RA1	RA2a	RA2b	RA3
RM1	Legacy rehabilitation works (reshaping, surface preparation, revegetation) completed	√	√		√
RM2	Contaminated land status	√			
RM3	Completion of all required stormwater management works	√		√	
RM4	Achievement of surface requirements	√	√	√	√
RM5	Achievement of grassland PMLU to a stable, safe and non-polluting condition (ML 10324)				√
RM6	Achievement of low intensity grazing PMLU to a stable, safe and non-polluting condition (ML 10324)	√	√	√	

3.5.4 Management milestones

The nominated management milestone (MM) for the single NUMA in the final landform is outlined in Table 16.

Table 16: Management milestones

Milestone reference	Description
MM1	Achievement of final landform design and surface and safety requirements. Achievement of sufficient improvement with respect to overtopping risk.

3.5.5 Milestone criteria and completion criteria

Key to assessing the success of rehabilitation and improvement is the definition of milestone criteria. Milestone criteria are preferably 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 has been identified for the Project to provide a clear definition of milestone completion and successful rehabilitation for each rehabilitation area or sufficient improvement of each improvement area. The milestone criteria demonstrate the completion of progressive rehabilitation or improvement steps and events. The completion criteria for each PMLU will be used as the milestone criteria for the final milestone in the proposed schedule, which shows achievement of the PMLU to a stable condition at surrender. The completion criteria for the NUMA will be used as milestone criteria for the final milestone in the proposed schedule, which shows achievement of sufficient improvement.

Completion criteria have been proposed in section 6 of the PMLUP (AARC 2020) (Appendix E), submitted to the department in 2020, and have been transitioned into the PRCP completion criteria. Where appropriate, completion criteria have been amended to meet the requirements of section 4 and section 6 of the PRCP Guideline (DES 2021a).

The rehabilitation milestones (RM) and management milestones (MM) for each RA and IA are provided in Table 17 and Table 24, respectively.

Table 17: Rehabilitation milestone criteria

Rehabilitation milestone	Applicable RA	Milestone criteria
RM1 – Legacy rehabilitation works (reshaping, surface preparation, revegetation) completed	RA1 RA2a RA3	a) With the exception of any infrastructure to remain as part of the post-mining land use (PMLU) or where infrastructure is agreed to be retained by the landholder as evidenced by a signed landholder agreement, the following are complete: i. All services disconnected, terminated and removed. ii. All buildings and associated infrastructure dismantled and removed offsite. iii. All hardstand, concrete areas and roads (bitumen, blue metal, aggregate etc.) removed. iv. All machinery and equipment removed from site. b) Reparation work undertaken after the date this transitional PRCP takes effect will include: i. Soil health, amelioration requirements and suitability are assessed and documented by an AQP⁽¹⁾ and confirm that the soil characteristics are suitable for the PMLU and target vegetation. ii. Seeding completed in Grazing PMLU areas using a selection of the recommended species listed in Table 4 Grazing Species Mix. iii. Seeding completed in Grassland PMLU areas using a selection of the recommended species in Table 5 Grassland Species Mix. c) An AQP¹ certifies that all rehabilitation works required for this RM have been completed.
RM2 – Contaminated land status	RA1	a) Contaminated Land Investigation Document completed in accordance with the Environmental Protection Act 1994, including a site investigation report, and, where required, a Validation Report and/or a draft Site Management Plan. b) A declaration from a suitably qualified person (SQP⁽²⁾) confirms that no contamination unsuitable for the post-mining land use remains.
RM3 – Completion of all required stormwater management works	RA1 RA2b	a) The PRCP schedule holder must provide to the administering authority a justification for all variations made to the Stormwater Management Plan (ATC Williams 2019). b) A report prepared by an AQP verifying that the final stormwater management arrangement for the site achieves the objectives stated in Section 4.1 of the Stormwater Management Plan (ATC Williams 2019).
RM4 – Achievement of surface requirements	RA1 RA2a RA2b RA3	a) With respect to erosion: i. No evidence of erosion classified as ‘moderate’ or ‘severe’ as defined by the Erosion classification framework⁽⁹⁾; and ii. Erosion requiring intervention has been remediated and does not impact achieving the outcome in RM4(a)(i). b) RA2A sediment dam – an AQP⁽¹⁾ certifies that: i. Water quality does not exceed the ANZECC/ARMCANZ (2000) Livestock Drinking Water Quality Guideline limits; and ii. Sediment samples as not containing contamination unsuitable for the post-mining land.
RM5 – Achievement of grassland PMLU to a stable, safe and	RA3	a) Hazard and safety assessment completed by an AQP⁽¹⁾ demonstrates hazards in rehabilitation areas are consistent with the type and severity of hazards typical of neighbouring equivalent land use.

Rehabilitation milestone	Applicable RA	Milestone criteria
non-polluting condition (ML 10324)		b) An AQP is to undertake an assessment of the available body of surface water quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream water quality complies with the limits in Table 1 – Surface water quality limits. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). c) If surface water quality exceeds criterion b) the applicable upstream site (Table 2) must be compared to the downstream site result; and quality measured at a downstream site must be equal to or less than the quality measured at the applicable upstream site⁽⁷⁾. d) An AQP is to undertake an assessment of the available body of sediment quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream sediment quality complies with ANZECC/ARMCANZ (2000) Interim Sediment Quality Guidelines – low. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). e) Restrictive invasive plants (as defined in the Biosecurity Act 2014) comprise less than 5% of vegetation ground cover. f) Total percentage of ground cover is $\geq 65\%$, where ground cover is defined as the cover of live plants, organic material (i.e. plant and leaf litter, twigs and woody debris) and rocks capable of protecting the soil surface from erosion. g) A species presence that is predominantly consistent with the grassland rehabilitation species mix provided in Table 5 – Grassland Species Mix. h) As determined using the satellite-derived fractional vegetation cover method⁽³⁾, rehabilitation polygons have a median fractional vegetation cover equal to or greater than 50% established and persistent groundcover⁽⁵⁾ at 30 September of each calendar year. i) Landholder agreement, transferring ownership and liability of the site agreed and signed by all relevant parties. j) Standard barbed wire fencing, with four barbed wire stands and the use of strainers as required have been erected around the perimeter of the grassland PMLU areas to prevent access by livestock. k) Waste rock dump assessed to be geotechnically stable by an AQP⁽¹⁾ and achieve a factor of safety of ≥ 1.5.
RM6 – Achievement of low intensity grazing PMLU to a stable, safe and non-polluting condition (ML10324)	RA1 RA2a RA2b	a) Hazard and safety assessment completed by an AQP⁽¹⁾ demonstrates hazards in rehabilitation areas are consistent with the type and severity of hazards typical of neighbouring equivalent land use. b) An AQP is to undertake an assessment of the available body of surface water quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream Sediment Monitoring Sites, demonstrating that downstream water quality complies with the limits in Table 1 – Surface water quality limits. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). c) If surface water quality exceeds criterion b) the applicable upstream site (Table 2) must be compared to the downstream site result; and quality measured at a downstream site must be

Rehabilitation milestone	Applicable RA	Milestone criteria
		equal to or less than the quality measured at the applicable upstream site⁽⁷⁾. d) An AQP is to undertake an assessment of the available body of sediment quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream sediment quality complies with ANZECC/ARMCANZ (2000) Interim Sediment Quality Guidelines – low. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). e) Restricted invasive plants (as defined in the Biosecurity Act 2014) comprise less than 5% of vegetation ground cover. f) Non-palatable weed presence is a maximum of 10% of total vegetative groundcover confirmed by an AQP⁽¹⁾ in annual monitoring. Weed management recommendations to be provided in annual reports. g) Excluding RA2A, for areas where slopes are less than 10%, rehabilitation polygons have a median fractional vegetation cover greater than the first quartile of reference polygons (Table 3) for at least 85% of all sample time, as determined using the satellite-derived fractional vegetation cover method⁽³⁾ and greater than 50% established and persistent vegetation groundcover⁽⁵⁾ at 30 September of each calendar year. h) Vegetation species diversity includes at least 3 desirable perennial pasture species (3P grasses) and 3 legume species or as agreed to by the landholder. i) All infrastructure to be retained for landholder use meets the requirements of conditions set out in the landholder agreement.

- AQP means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods, or literature.
- Suitably qualified person (SQP) for performing a regulatory function under chapter 7, part 8 (Contaminated Land) of the EP Act or another function prescribed under a regulation, means a person who:
 - has qualifications and experience relevant to performing the function; and
 - if a regulation prescribes an organisation for this paragraph – is a member of the organisation.
- The method for satellite-derived fractional vegetation cover is outlined in 3.7.2 of the PRC Plan version 4 dated 30 October 2023
- Excluding the typical inundation extent at the sediment dam. These areas will frequently experience die-off and regrowth resulting from inundation events.
- Ground cover means plants, plant litter, tree leaf litter, twigs and woody debris capable of protecting the soil surface from erosion.
- Environmentally problematic materials means waste rock or processing materials that include one of the following characteristics: Potentially Acid Forming (PAF), saline, sodic, dispersive, high metal/metalloid concentrations and solubility.
- For pH, the quality result measured at the downstream location must be within the prescribed range. However, where pH at the downstream location is greater than (>) the highest limit in the range, the pH at the applicable upstream location must be greater than or equal to (≥) the downstream location. Conversely, where pH at the downstream location is less than (<) the lowest limit in the range, the upstream pH at the applicable upstream location must be less than or equal to (≤) the downstream location.
- Definition of stabilised:
 - One or both of the following conditions apply:
 - no evidence of sediment movement;
 - sides and/or floors of erosion form are revegetated.

9. Erosion classification:

Table 18: Erosion classification framework

Erosion classification	Minor	Moderate	Severe
Sheet erosion	Shallow soil deposits downslope	Partial exposure of roots; moderate soil deposits downslope	Loss of surface horizon; subsoil exposure; root exposure; substantial soil deposits downslope
Rill per 50 m transect	<15 rills pre transect*	15-30 rills per transect*	>30 rills per transect*
Gully erosion per 50 m transect	Absent	Absent	Present
Tunnel erosion	Absent	Absent	Present
Mass movement	Absent	Absent	Present

Table 19: Table 1. Surface water quality limits

Quality characteristic (units)	Limit	Comments on limit
pH	6.0-8.5	Site-specific
Electrical Conductivity (µS/cm)	200	Site-specific based on upstream data
Turbidity (NYU)	50	Site-specific based on upstream data
Sulphate (mg/L)	2	Upper Burdekin River catchment waters WQO
Nitrate (mg/L)	0.6	Site-specific
Aluminium - dissolved (µg/L)	500	Site-specific based on upstream data
Arsenic - dissolved (µg/L)	13	ANZG 2018
Cadmium - dissolved (µg/L)	0.2	ANZG 2018
Cobalt - dissolved (µg/L)	13	Site-specific
Chromium - dissolved (µg/L)	1	ANZG 2018
Copper - dissolved (µg/L)	3	Site-specific
Nickel - dissolved (µg/L)	11	ANZG 2018
Zinc - dissolved (µg/L)	14	Site-specific
Major ions (mg/L) Calcium, chloride, potassium, magnesium, sodium, bicarbonate, carbonate	For interpretation purposes only	
Hardness (mg/L)	For interpretation purposes only	

Notes:

- All metals and metalloids must be measured as 'dissolved' (from analysis of a field filtered sample) and total (unfiltered).
- Limits for metals and metalloids apply to dissolved results.

Table 20: Table 2. Surface Water and Stream sediment Monitoring Sites

Monitoring Points	Location Description	Latitude (GDA94)	Longitude (GDA94)
Upstream Monitoring Locations			
LBUS1	Snake Creek approximately 800 metres upstream of site disturbance	-19.476129	145.684473
LBUS2	Snake Creek approximately 500 metres upstream of site disturbance	-19.475612	145.688002
Downstream Monitoring Locations			
LBDS1	Snake Creek approximately 1000 metres downstream of RP1 (Sediment Dam 1)	-19.47549	145.69960
LBDS2	Snake Creek approximately 2000 metres downstream of RP1 (Sediment Dam 1)	-19.476218	145.709432



Figure 15: Figure 3: Surface Water and Stream sediment Monitoring Sites

Table 21: Table 3. Analogue/Reference sites

Proposed Analogue Site	Northing (GDA 94)	Easting (GDA 94)	Regional ecosystem (RE)
REF 1	–19.4777	145.6872	9.3.22 Eucalyptus crebra woodland
REF 2	–19.4775	145.692	9.3.22 Eucalyptus crebra woodland
REF 3	–19.4795	145.6873	9.5.3/9.5.11 Eucalyptus crebra woodland
REF 4	–19.4803	145.6872	9.5.3/9.5.11 Eucalyptus crebra woodland

Table 22: Table 4. Grazing Species Mix

Species Name	Common Name
Shrubs and Trees	
<i>Neptunia dimorphantha</i>	Sensitive plant
<i>Acacia holosericea</i>	Silver Wattle
<i>Breynia oblongifolia</i>	Coffee Bush
<i>Sida subspicata</i>	Spiked Sida
<i>Carissa lanceolata</i>	Currant Bush
Grasses	
<i>Heteropogon contortus</i> *	Black Spear grass
<i>Aristida calycina</i> var. <i>calycina</i>	Dark Wiregrass Aristida
<i>Melinis repens</i>	Red natal grass
<i>Themeda triandra</i> *	Kangaroo grass
<i>Chloris gayana</i> #	Rhodes Grass
<i>Urochloa mosambicensis</i>	Sabi Grass
<i>Panicum decompositum</i> *	Native millet
Legumes	
<i>Rhynchosia minima</i> *	Rhyncho
<i>Glycine tabacina</i> *	Variable Glycine
<i>Desmodium trichostachyum</i> *	

Footnotes

*Native 3P species.

#Landholder-approved introduced pasture species.

Table 23: Table 5. Grassland Species Mix

Plant Structure	Species Name	Common Name
Native tree/ shrub	<i>Acacia salicina</i>	Sally Wattle
	<i>Acacia holosericea</i>	Silver Wattle
Native forb/ herbaceous	<i>Stylosanthes scabra</i> *	Shrubby Stylo
	<i>Glycine tabacina</i> *	Variable Glycine
	<i>Rhynchosia minima</i> *	Rhyncho
	<i>Achyranthes aspera</i>	Chaff flower
	<i>Sida fibulifera</i>	Pin sida
	<i>Stylosanthes hamata</i>	Caribbean Stylo
	<i>Phyllanthus maderaspatensis</i>	Spurge
	<i>Sida hacketiana</i>	Queensland hemp
Native grass	<i>Heteropogon contortus</i>	Blackheaded Speargrass
Pasture grass	<i>Chloris gayana</i>	Rhodes grass
	<i>Melinis repens</i>	Red Natal
	<i>Bothriochloa pertusa</i>	Indian Bluegrass

Footnotes

* Indicates a legume species

Table 24: Management milestone criteria

Management milestone	Applicable improvement areas	Milestone criteria
MM1 - Achievement of final landform design and surface and safety requirements. Achievement of sufficient improvement with respect to overtopping risk.	IA1	1.a) Final void landform with overall slopes less than 22 degrees as certified by an AQP⁽¹⁾. 1.b) Void assessed to be geotechnically stable by an AQP⁽¹⁾ and achieve a factor of safety of ≥ 1.5. 1.c) AQP⁽¹⁾ has certified i. that the pit void is not connected to Snake Creek or other surface waters via the alluvium. ii. that appropriate erosion control measures are in place to minimise erosion. iii. erosion within the NUMA area will not negatively impact on the adjacent rehabilitation areas, or their ability to sustain their PMLU. 1.d) Fencing installed commensurate to the risks assessed. 1.e) Safety signage designed in accordance with Australian Standard is erected at 100m intervals along the fence line. 1.f) Having considered an appropriate water quality data set, and modelling certification from an AQP⁽¹⁾ that: i. the residual void will not cause material environmental harm outside of the relevant tenure boundary; and ii. that appropriate controls are in place to ensure that water quality from the void does not impact the adjoining low intensity grazing land use.

1. AQP means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods, or literature.

3.5.6 Rehabilitation timeframes

The Project is in a phase of final rehabilitation, with activities focused on preparing the site for surrender and relinquishment of the MLs within the next five years. A number of rehabilitation milestones are considered to have been met and timeframes for the remaining milestones have been developed with consideration to the remaining works required. Following completion of stormwater management works, rehabilitation monitoring is anticipated to be the key action before a surrender application is submitted. When developing milestone durations, allowances have been made for expected variation in factors such as climate and unfavourable growing seasons, as well as unforeseen extreme events such as droughts or storms. These factors may negatively impact vegetation establishment, so some contingency has been provided for the milestone to be achieved. The nominated milestone timeframes are outlined in Table 25.

Table 25: Justification of timeframes for achievement of milestones

Milestone transition	Summary of completion criteria	Associated risks	Assigned timeframe	Justification for assigned timeframe
RM1	a) With the exception of any infrastructure to remain as part of the post-mining land use (PMLU) or where infrastructure is agreed to be retained by the landholder as evidenced by a signed landholder agreement, the following are complete: i. All services disconnected, terminated and removed. ii. All buildings and associated infrastructure dismantled and removed offsite. iii. All hardstand, concrete areas and roads (bitumen, blue metal, aggregate etc.) removed. iv. All machinery and equipment removed from site. b) Reparation work undertaken after the date this transitional PRCP takes effect will include: i. Soil health, amelioration requirements and suitability are assessed and documented by an AQP⁽¹⁾ and confirm that the soil characteristics are suitable for the PMLU and target vegetation. ii. Seeding completed in Grazing PMLU areas using a section of the recommended species listed in Table 4 Grazing Species Mix. iii. Seeding completed in Grassland PMLU areas using a selection of the recommended species in Table 5 Grassland Species Mix. c) An AQP¹ certifies that all rehabilitation works required for this RM have been completed.	Certain rehabilitation works may not have been completed.	n/a	Most rehabilitation areas have been subject to legacy rehabilitation requirements except for the sediment dam and haul road. The haul road may be suitable for use as a site access. The sediment dam is a minor depression in the landform and rehabilitation monitoring demonstrates good revegetation success.
RM2	a) Contaminated Land Investigation Document completed in accordance with the Environmental Protection Act 1994, including a site investigation report, and, where required, a Validation Report and/or a draft Site Management Plan. b) A declaration from a suitably qualified person (SQP⁽²⁾) confirms that no contamination unsuitable for the post-mining land use remains.	Residual contaminated land from past operational activities.	6 months	This milestone is low risk, as such the timeframe of 6 months has been nominated as this is the time anticipated to be required to conduct the site assessment and prepare the report.
RM3	a) The PRCP schedule holder must provide to the administering authority a justification for all variations made to the Stormwater Management Plan (ATC Williams 2019). b) A report prepared by an AQP verifying that the final stormwater management arrangement for the site achieves the objectives stated in Section 4.1 of the Stormwater Management Plan (ATC Williams 2019).	- Climate restricts site access to complete works. - Near future seasons hinder successful revegetation.	6 months to 3 years	Most of the disturbed areas are considered to already have met most, if not all the milestone criteria for RM3. The proposed timeframe considers the requirement to complete stormwater management works and revegetation of those features during dry conditions, followed by one or two reasonable wet seasons. The proposed timeframe also provides allowance for rehabilitation and other assessments to be undertaken as well as for the preparation of appropriate assessment reports.
RM4	a) With respect to erosion: i. No evidence of erosion classified as ‘moderate’ or ‘severe’ as defined by the Erosion classification framework⁽⁹⁾; and ii. Erosion requiring intervention has been remediated and does not impact achieving the outcome in RM4(a)(i). b) RA2A sediment dam – an AQP⁽¹⁾ certifies that:	- Uncontained erosion of rehabilitated landforms. - Failure of water management system components. - Release of contaminants to the downstream environment.	2 - 4 years	Timeframe is considered sufficient for demonstrating erosion risks post rehabilitation. Water and sediment quality data collected during the assigned timeframe allows for sufficient quality data collection to detect any potential sources of contamination.

Milestone transition	Summary of completion criteria	Associated risks	Assigned timeframe	Justification for assigned timeframe
	i. Water quality does not exceed the ANZECC/ARMCANZ (2000) Livestock Drinking Water Quality Guideline limits; and ii. Sediment samples as not containing contamination unsuitable for the post-mining land.			
RM5	a) Hazard and safety assessment completed by an AQP ⁽¹⁾ demonstrates hazards in rehabilitation areas are consistent with the type and severity of hazards typical of neighbouring equivalent land use. b) An AQP is to undertake an assessment of the available body of surface water quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream water quality complies with the limits in Table 1 – Surface water quality limits. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). c) If surface water quality exceeds criterion b) the applicable upstream site (Table 2) must be compared to the downstream site result; and quality measured at a downstream site must be equal to or less than the quality measured at the applicable upstream site ⁽⁷⁾ . d) An AQP is to undertake an assessment of the available body of sediment quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream sediment quality complies with ANZECC/ARMCANZ (2000) Interim Sediment Quality Guidelines – low. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). e) Restrictive invasive plants (as defined in the Biosecurity Act 2014) comprise less than 5% of vegetation ground cover. f) Total percentage of ground cover is ≥65%, where ground cover is defined as the cover of live plants, organic material (i.e. plant and leaf litter, twigs and woody debris) and rocks capable of protecting the soil surface from erosion. g) A species presence that is predominantly consistent with the grassland rehabilitation species mix provided in Table 5 – Grassland Species Mix. h) As determined using the satellite-derived fractional vegetation cover method ⁽³⁾ , rehabilitation polygons have a median fractional vegetation cover equal to or greater than 50% established and persistent groundcover ⁽⁵⁾ at 30 September of each calendar year. i) Landholder agreement, transferring ownership and liability of the site agreed and signed by all relevant parties. j) Standard barbed wire fencing, with four barbed wire stands and the use of strainers as required have been erected around the perimeter of the grassland PMLU areas to prevent access by livestock. k) Waste rock dump assessed to be geotechnically stable by an AQP ⁽¹⁾ and achieve a factor of safety of ≥1.5.	- Excessive surface roughness creates a safety hazard - Uncontained erosion of rehabilitated landforms - Release of contaminants to the downstream environment - Pest and weed invasion - Near future seasons hinder successful revegetation	2 years	Some of the disturbed areas are considered to already have met most, if not all the milestone criteria for RM5, and provide demonstration that RM5 can be achieved. Achievement of target revegetation criteria is dependent on good climatic conditions and soil preparation. Allowance is made for poor growing seasons and extreme events such as droughts or storms that will negatively impact vegetation establishment, and consequent maintenance actions that may be required. Given the size of area that is required to be rehabilitated, the previous rehabilitation requirements and the low-moderate risk, a timeframe of 2 years from achievement of RM5 is believed sufficient to address the low-level of risk to achieving this milestone.

Milestone transition	Summary of completion criteria	Associated risks	Assigned timeframe	Justification for assigned timeframe
RM6	a) Hazard and safety assessment completed by an AQP⁽¹⁾ demonstrates hazards in rehabilitation areas are consistent with the type and severity of hazards typical of neighbouring equivalent land use. b) An AQP is to undertake an assessment of the available body of surface water quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream water quality complies with the limits in Table 1 – Surface water quality limits. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). c) If surface water quality exceeds criterion b) the applicable upstream site (Table 2) must be compared to the downstream site result; and quality measured at a downstream site must be equal to or less than the quality measured at the applicable upstream site⁽⁷⁾. d) An AQP is to undertake an assessment of the available body of sediment quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream sediment quality complies with ANZECC/ARMCANZ (2000) Interim Sediment Quality Guidelines – low. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). e) Restrictive invasive plants (as defined in the Biosecurity Act 2014) comprise less than 5% of vegetation ground cover. f) Non-palatable weed presence is a maximum of 10% of total vegetative groundcover confirmed by an AQP⁽¹⁾ in annual monitoring. Weed management recommendations to be provided in annual reports. g) Excluding RA2A, for areas where slopes are less than 10%, rehabilitation polygons have a median fractional vegetation cover greater than the first quartile of reference polygons (Table 3) for at least 85% of all sample time, as determined using the satellite-derived fractional vegetation cover method⁽³⁾ and greater than 50% established and persistent vegetation groundcover⁽⁵⁾ at 30 September of each calendar year. h) Vegetation species diversity includes at least 3 desirable perennial pasture species (3P grasses) and 3 legume species or as agreed to by the landholder. i) All infrastructure to be retained for landholder use meets the requirements of conditions set out in the landholder agreement.	- Excessive surface roughness creates a safety hazard - Uncontained erosion of rehabilitated landforms - Release of contaminants to the downstream environment - Pest and weed invasion - Near future seasons hinder successful revegetation	1 - 4 years	Some of the disturbed areas are considered to already have met most, if not all the milestone criteria for RM6, and provide demonstration that RM6 can be achieved. Achievement of target revegetation criteria is dependent on good climatic conditions and soil preparation. Allowance is made for poor growing seasons and extreme events such as droughts or storms that will negatively impact vegetation establishment, and consequent maintenance actions that may be required. Given the size of area that is required to be rehabilitated, the previous rehabilitation requirements and the low-moderate risk a timeframe of 1-4 years from achievement of RM6 is believed sufficient to address the low-level of risk to achieve this milestone.
MM1	1.a) Final void landform with overall slopes less than 22 degrees as certified by an AQP⁽¹⁾. 1.b) Void assessed to be geotechnically stable by an AQP⁽¹⁾ and achieve a factor of safety of ≥ 1.5. 1.c) AQP⁽¹⁾ has certified - that the pit void is not connected to snake creek or other surface waters via the alluvium. - that appropriate erosion control measures are in place to minimise erosion.	- Void areas still accessible by unauthorised public and/or livestock. - Slope failure. - Erosion on highwalls. - Release of contaminants to the downstream environment due to overtopping event.	7 years	The nominated timeframe allows for the completion of stormwater management works, which are to mitigate the risk of overtopping of the void. The final void has undergone geotechnical stability assessment previously (GeoSquare 2019) and only installation of fencing and signage remains to be undertaken.

Milestone transition	Summary of completion criteria	Associated risks	Assigned timeframe	Justification for assigned timeframe
	iii. erosion within the NUMA area will not negatively impact on the adjacent rehabilitation areas, or their ability to sustain their PMLU. 1.d) Fencing installed commensurate to the risks assessed. 1.e) Safety signage designed in accordance with Australian Standard is erected at 100m intervals along the fence line. 1.f) Having considered an appropriate water quality data set, and modelling certification from an AQP⁽¹⁾ that: i. the residual void will not cause material environmental harm outside of the relevant tenure boundary; and ii. that appropriate controls are in place to ensure that water quality from the void does not impact the adjoining low intensity grazing land use.			

1. AQP means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods, or literature.
2. Suitably qualified person (SQP) for performing a regulatory function under chapter 7, part 8 (Contaminated Land) of the EP Act or another function prescribed under a regulation, means a person who:

• has qualifications and experience relevant to performing the function; and

• if a regulation prescribes an organisation for this paragraph – is a member of the organisation.
3. The method for satellite-derived fractional vegetation cover is outlined in 3.7.2 of the PRC Plan version 4 dated 30 October 2023
4. Excluding the typical inundation extent at the sediment dam. These areas will frequently experience die-off and regrowth resulting from inundation events.
5. Ground cover means plants, plant litter, tree leaf litter, twigs and woody debris capable of protecting the soil surface from erosion.
6. Environmentally problematic materials means waste rock or processing materials that include one of the following characteristics: Potentially Acid Forming (PAF), saline, sodic, dispersive, high metal/metalloid concentrations and solubility.
7. For pH, the quality result measured at the downstream location must be within the prescribed range. However, where pH at the downstream location is greater than (>) the highest limit in the range, the pH at the applicable upstream location must be greater than or equal to (≥) the downstream location. Conversely, where pH at the downstream location is less than (<) the lowest limit in the range, the upstream pH at the applicable upstream location must be less than or equal to (≤) the downstream location.
8. Definition of stabilised:

• One or both of the following conditions apply:

○ no evidence of sediment movement;

○ sides and/or floors of erosion form are revegetated.
9. Erosion classification (Table 18).

3.5.7 Final landform design

The final landform design and its implementation were inherited by AUZ following the acquisition of the site post-closure. The following sections describe the Project final landform design.

Waste rock dump

A single WRD is located immediately to the north of the final void. Following the completion of mining, the WRD was reshaped to reduce batter angles to nominally 10°, with areas of localised maximum slope of 14°, and a maximum height of 10 m. The WRD was constructed to be water shedding with runoff captured by the sediment dam.

Site investigations conducted since September 2018 show that the WRD landform has remained stable with an intact surface of rock-raked, gravelly topsoil and little evidence of erosion. Minor erosion gullies on the WRD slope have been repaired as part of remedial rehabilitation works. A small number of pioneering Acacia shrubs were noted on the surface of the WRD along with a variety of grasses (*Heteropogon contortus*, *Aristida sp.* and *Chloris sp.*) and forbs (*Stylosanthes scabra*, *Sclerolaena sp.* and *Chenopodium sp.*).

The administering authority raised concerns during the information and decision stages of the Transitional PRCP application process about potential nickel enrichment in soils (WRD and ROM pad) and whether the WRD landform slope gradients (up to 14%) can support grazing cattle. Given these concerns, it has been agreed that the WRD final landform is better suited to a grassland PMLU rather than low-intensity grazing. The WRD landform will be fenced to exclude livestock.

ROM pad

At closure, ROM material was removed and the ROM pad was reprofiled, topsoiled and seeded. Site investigations undertaken since 2018 suggest that topsoil material was likely sourced from one of the topsoil stockpiles stripped from the Corea, Cape or Barkla soil units prior to the commencement of mining. The topsoil was applied across the mine disturbance areas (pit void, WRD and ROM pad).

The Corea soil unit is associated with the lateritic clay outcrop of the once protruding ore body and consequently features naturally mineralised soil properties as discussed in section 3.5.8.7. Given concerns about elevated metal concentrations in the rehabilitation topsoils of the ROM pad, it was agreed that this area would be returned to a grassland PMLU rather than low intensity grazing. Exclusion fencing will be installed at the perimeter of the ROM pad to prevent livestock access.

Final void

The final void was stabilised, re-profiled and topsoiled to reduce batter angles prior at the completion of mining by QNPL. ATC Williams (2019a) was commissioned by AARC on behalf of AUZ to assess the final void structure and stability. A detailed contour survey indicates that the void is 400 m long and 80 m wide with batter angles of approximately 20° (ATC Williams 2019a). Safety berms have been installed to the southern and eastern boundaries of the pit.

A pit wall stability study was undertaken by ATC Williams (2019a). There is a very low risk of geotechnical instability affecting the mining void except for existing erosion from water flowing into the pit (ATC Williams 2019a). ATC Williams (ATC Williams 2019b) proposed the construction of additional stormwater management bunds to minimise future erosion potential of the batter (refer section 3.5.8.4).

A consequence category assessment of the void was also undertaken by ATC Williams (2019c) which concluded that the void has a 'low' consequence for failure to contain 'overtopping'.

Should any slip failures occur in the relatively weak soils and upper portion of the weathered rock, it is likely that this would be a relatively low-angle failure with materials being contained within the mining void. The relatively shallow batter slope angles reduce the risk of toppling or wedge failures in any exposed rock (ATC Williams 2019b). No failures have occurred to date.

Sediment dam

The sediment dam consists of a shallow basin located in the lowest point of the Dingo Dam ML. The eastern extent of the sediment dam is bunded immediately adjacent to the ML boundary. The bund stands to an approximate height of 1.37 m with a basal width of approximately 10 m. The current capacity of the dam is approximately 30 ML. At a site inspection carried out in December 2019, this area was dry and contained mature trees with scattered groundcover vegetation.

Pending further consultation with the landowner, no further active rehabilitation of the sediment dam is proposed.

Water management

Stormwater controls for the final landform were initially installed at the cessation of mining activities. In 2019 ATC Williams were commissioned by AUZ to undertake an assessment of the hydrology of the current landform, following rainfall events resulting in overtopping of the final void. ATC Williams (2019b) developed a Stormwater Management Plan with several recommendations to minimise overtopping of the void and lower erosion potential associated with the overtopping of water from Dingo Dam to the final void. Some minor modifications to the design of the stormwater features were made as a result of consultation with the landowner. The Stormwater Management Plan involves a set of relatively minor earthworks to create new bunds/embankments, remove bunds/embankments at various locations and re-grading works to direct flows to preferable flow paths. The resultant stormwater management plan includes the use of bunds, drains and the sediment dam. The water management system is described in section 3.5.8.4

Stability of the final landform

Inspections undertaken of existing rehabilitation works indicate that the landform is in a stable condition. With reparation of erosion areas and the stormwater management modifications (refer section 3.5.8.4), it is considered that the final landform will remain in a safe and stable condition.

Quality assurance / quality control

Rehabilitation activities will be carried out in accordance with the applicable methods described in this document and records will be maintained to demonstrate achievement of rehabilitation milestones. The monitoring and maintenance program (section 3.7) has been developed to ensure that rehabilitation progresses towards achievement of milestone criteria and ultimately relinquishment. Rehabilitation monitoring will allow for timely identification of the need for corrective action or maintenance work, and changes to the rehabilitation strategy based on past rehabilitation successes and failures; and as new information becomes available.

The site has been subject to various assessments with a view to increasing knowledge of the site and confirming and monitoring the rehabilitation activities that occurred prior to AUZ's ownership. All these activities have improved the quality of information relating to the site and the control of rehabilitation activities.

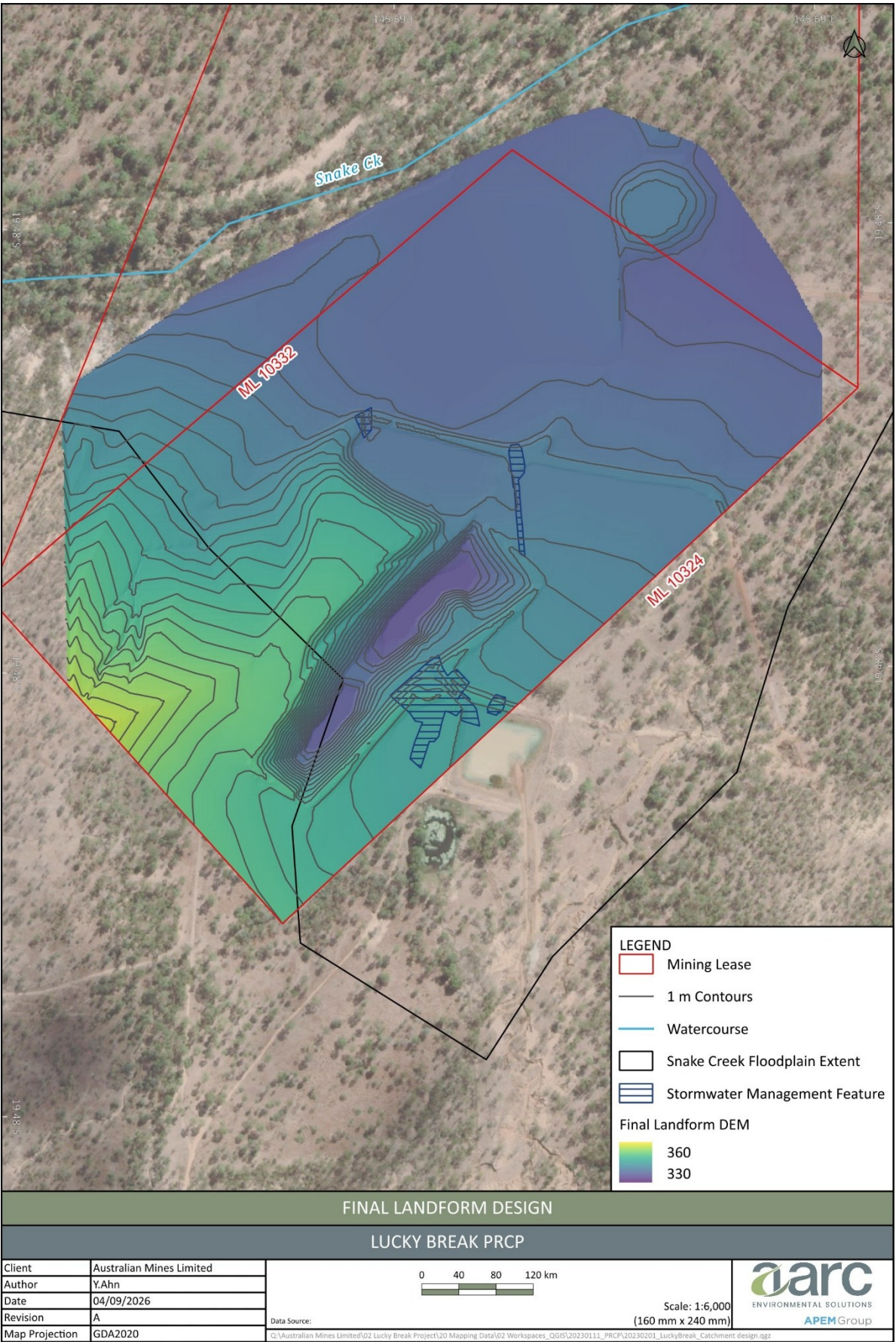


Figure 16: Final landform design

3.5.8 General rehabilitation practice

As has been indicated previously, the Lucky Break Project had been subject to rehabilitation prior to AUZ acquiring the site. A record of the existing rehabilitation efforts at site is provided at section 3.1.1.2, and rehabilitation objectives, performance indicators and completion criteria for the Project have been detailed at sections 3.5.1 and 3.5.5.

From the perspective of demonstrating that rehabilitation has progressed to the point that surrender of the MLs and the EA can be achieved, the following overarching principles are relevant:

- Ensuring that drainage systems resulting from reshaped areas meet the updated design specification and are operating in a manner that will be sustainable for the long term.
- Utilising rehabilitation monitoring data to demonstrate rehabilitated area performance against completion criteria and that rehabilitation is sufficient to achieve ML/ EA surrender.

3.5.8.1 Hydrogeology

A conceptual hydrological model was developed for the Project to determine the potential groundwater interaction with the final void (GeoSquare 2019). The model indicated that the potential for flow from Snake Creek through the subsurface to the final void is extremely low. Similarly, the potential for subsurface flow from the void to Snake Creek is extremely low due to the limited hydraulic head and the presence of a low permeability zone.

The conceptual model indicates that no recharge below the open pit to aquifer units is possible due to the intrusive body and in-situ lateritic materials. Water in the open pit can either evaporate or permeate laterally through the subsurface based on hydraulic head. The residual void is not anticipated to intercept groundwater, with the maximum depth of extraction well above the predicted depth to groundwater of 30 mbgl (GeoSquare 2019). Additionally, the final void is in an area of very low permeability, resulting in minimal potential for transport of water and dissolved solids. The void is formed within a clay type mineralisation zone with the base of the final void being almost impermeable (GeoSquare 2019).

It is expected that rainfall runoff or inundation from external sources will stand in the base of the pit, and that due to the non-sodic nature of the ore and waste rock water, salinity will remain low.

3.5.8.2 Flooding

The final void is located within the floodplain of Snake Creek (Department of Resources 2023) as shown in Figure 17. The Queensland Flood Mapping Program 2015 series provides a high-level flood mapping dataset for the 1% Annual Exceedance Probability (AEP) and the extreme storm event (ATC Williams 2019b), which has a pixel resolution of 100 m, a variable depth resolution of 0.5–1.0 m and utilises a pre-mining topography. Review of the data shows that the Dingo Dam site would not be expected to be inundated by regional storm flow from Snake Creek during the 1% AEP event but may experience flooding up to 0.5 m depth during the extreme storm event. However, it is noted that no flooding of the site from Snake Creek has occurred during the time it has been monitored.

It is predicted that persistent (3 days) flood level within Snake Creek does not extend beyond 338 mAHD (GeoSquare 2019). Cross sections of the final site contours indicate that the pit walls reach an elevation of 345 mAHD, therefore, flooding into the pit from Snake Creek is not possible (GeoSquare 2019). Further assessment of the post-mining landform and topography indicates that were flooding to occur, the area within which the main rehabilitated landforms occur will be within a backwater not subject to any significant flood flow velocities. The main post-mining landforms subject to inundation will be the sediment dam bund and the bund below the ROM pad area. These are both low-profile, revegetated structures able to withstand low depth and low velocity flood flows.

An assessment of flooding within the Stormwater Management Plan ATC Williams (2019b) concluded that the risk of any impact to environmental values associated with flooding of the void would be highly unlikely,

with overtopping of the void from received surface inflows more likely to present a risk of environmental harm to the receiving environment.

A consequence category assessment undertaken indicated a consequence category of 'low' for 'Failure to Contain Overtopping' - refer to section 3.5.8.4 and the supporting technical report (ATC Williams 2019b) in Appendix E.

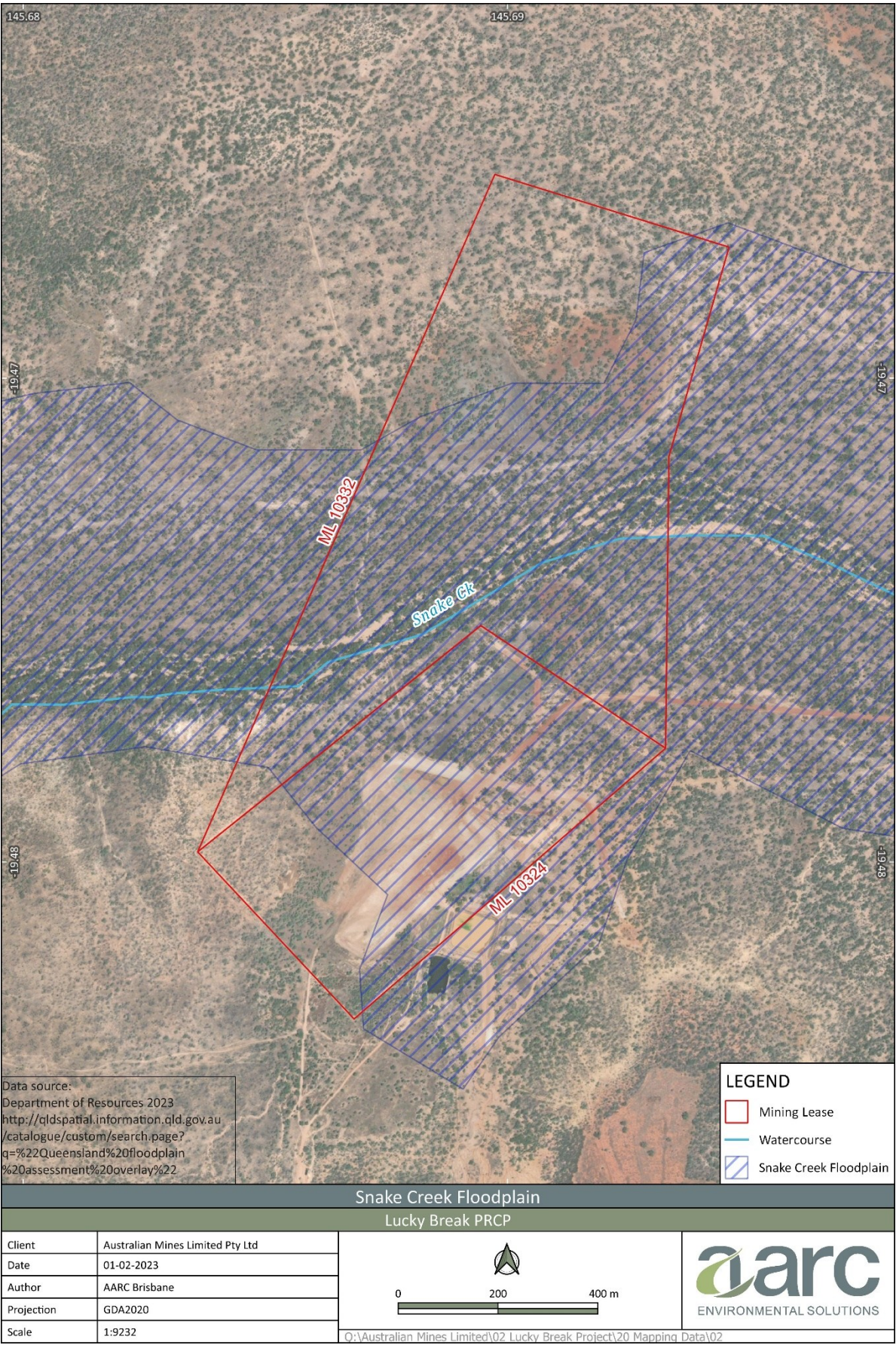


Figure 17: Snake Creek: extreme storm event inundation

3.5.8.3 Final void

Water balance

A water balance model has been prepared for the Project site based on the proposed final landforms and site water management system (ATC Williams 2019c). Prior to recent works, Dingo Dam, located immediately upgradient of the final void, directed overflows into the void while diversion bunds directed clean water runoff from upstream of the Project site across the ROM pad and into the sediment dam. Amendments to the drainage system redirect overflows from Dingo Dam away from the void, and the construction of drains will divert additional catchment around the residual void.

The water balance model demonstrates that, following the completion of stormwater management works, the residual void will have a storage capacity of 37.7 ML. The risk of future overtopping of the void is expected to be significantly lower given the reduction in catchment reporting to the void. Hydraulic modelling indicates that only very high rainfall years will result in the void overtopping.

The volume potentially discharged under a 'failure to contain—overtopping' scenario has been estimated for various annual rainfall scenarios. Where the AEP is 1:100, the accumulated spill volume is estimated to be 10.5 ML. The 1:20 AEP accumulated spill volume for the first year is estimated to be 5.7 ML. Lower rainfall years are not expected to result in a spill event (ATC Williams 2019c).

Water quality

Overtopping events from the final void have occurred during the significant rainfall events associated with the wet seasons of 2018/19 and 2021/22. Water quality results sampled during this period indicate total aluminium can occur at concentrations above the ANZECC (2000) guideline level for stock drinking water (5 mg/L) with values recorded in the range of 5.42 mg/L (February 2019) up to 14.9 mg/L (March 2022). During some of these events, the sediment dam (release point) was found to contain concentrations of dissolved aluminium, chromium, cobalt, copper and nickel above the respective EA trigger levels. Total aluminium was also elevated at the sediment dam release point. The upstream stock water dam (Dingo Dam) has been identified as a primary source of the elevated aluminium concentrations.

Water quality data from receiving environment sampling triggered by these events were analysed and compared against EA trigger levels and contaminant limits. Where quality characteristics in water stored or released from site, or where downstream receiving water exceeded any of the EA trigger levels, the downstream results were compared to the upstream reference site values.

Despite the presence of elevated metals at the release point, dissolved aluminium was the only metal concentration found to be elevated in the downstream receiving environment at the time of the release and during follow-up sampling. Dissolved aluminium concentrations recorded at upstream sites on Snake Creek were equally elevated, indicating these levels are likely to be indicative of natural mineralisation in the region of the Project site.

Earthworks were undertaken in December 2022 and October 2023 to repair the gully and install diversion bunds around the void, effectively separating the non-mined clean water catchment of Dingo Dam from the void catchment. These works have significantly reduced the volume of clean water reporting to the void and, subsequently, have improved the void water quality and reduced the risk of the void overtopping.

Inflows and outflows

Section 3.5.8.1 and section 3.5.8.2 discuss void inflows and outflows and the potential for void overtopping.

The Dingo Dam void historically contains low levels of standing water with high levels of aluminium. Water quality testing indicates total aluminium regularly occurs at concentrations above the ANZECC (2000) guideline level for stock drinking water (5 mg/L) with values recorded in the range of 5.42 mg/L (February 2019) up to 18 mg/L (April 2016).

The boundary of the Dingo Dam ML is currently fenced to exclude livestock. Given the potentially high levels of aluminium in the Dingo Dam final void, it is intended that the void will remain as a NUMA and the perimeter of the final void will be separately fenced to ensure the landform remains safe to humans and animals.

The Department of Natural Resources, Mines and Energy (DNRME) was consulted to determine the appropriate safety provisions required for the Dingo Dam final void. DNRME advised that there is no requirement for both bunding and fencing to make a final void safe. The *Mining and Quarrying Safety and Health Regulation* 2017 states that if an excavation exists, appropriate facilities must be installed around the excavation (e.g., a fence, barricade, bund wall or signage). Of these facilities, a fence is considered the most secure option where future vegetation growth could conceal a drop off beyond a bund. Based on the profiled, stable condition of the void and the regional location and lack of public access, standard fencing and signage is considered adequate for ensuring public safety and the exclusion of livestock.

Vegetation has established on the batters in the period following construction, however, erosion rills on the batter slopes suggest that water is freely draining down the batters. Current stormwater management works will reduce surface runoff accessing void batters.

Future rehabilitation activities required for the final void include the installation of standard fencing and signage and the construction of stormwater management bunds to minimise the catchment of clean water reporting to the void as per the Stormwater Management Plan (ATC Williams 2019a).

3.5.8.4 Water management

There is no legacy water from the mining activity remaining on the site. The key water management aspects associated with the site relate to stormwater collected in the pit void and stormwater drainage. These aspects are discussed in the following subsections.

During the operational phase of the Project, and apart from water collection and sedimentation systems and processes, no wastewater collection, reticulation or treatment systems are, or have been, operated on the Project site.

Decommissioning and rehabilitation works already undertaken have significantly reduced the potential for contamination resulting from the Project to the receiving environment.

Stormwater management

In 2019, ATC Williams was commissioned to review and assess the status of the stormwater management at the site with a view to recommend modifications to the stormwater drainage system (ATC Williams 2019b). The proposed modifications are intended to ensure that:

- catchment areas reporting to the pit void are minimised to limit the risk of the void overtopping;
- natural drainage paths are restored, where possible, to minimise impounded water; and
- potential for environmental harm, such as erosion, is minimised.

ATC Williams (2019b) modifications are incorporated into the Stormwater Management Plan for the site.

Modifications to the drainage system have reduced the total catchment to the void to 4.9 ha, which is a reduction of 74.5 ha of catchment area. Following consultation with the landowner, slight modifications to the placement of stormwater features were incorporated into the final design to avoid areas of existing erosion (located off-lease). The modifications include:

- modification to the placement of the spillway located on the south-eastern corner of Dingo Dam (off lease) to the north-eastern corner of Dingo Dam (on lease);
- construction of a bund to direct water flow to the sediment dam; and

- the proposed regrading of the section of haul road located at the void overflow point is no longer required following the construction of the new bund (mentioned above).

The final constructed drainage system is shown in Figure 18.

Retained water management structures

Decommissioning and rehabilitation strategies aim to achieve safe, stable, non-polluting and sustainable final landforms. A consequence category assessment was undertaken on the site storage structures (Dingo Dam, Final Void and Sediment Dam) and a summary of the outcomes is shown in Table 26. The consequence categories for structures, where applicable were rated as 'low'.

For the pit void, no further works are proposed other than the installation of standard fencing and signage and the stormwater modification works recommended by ATC Williams (2019b). The residual void area will continue to be subject to monitoring in accordance with the rehabilitation monitoring program (AARC 2020c).

The sediment dam, while only intermittently retaining water, is proposed to be retained on the basis that further rehabilitation works will disrupt a well vegetated and stabilised area.

Dingo Dam will be retained with its current use and under the operational control of the landowner. Apart from the stormwater modification works as per ATC Williams, no other works are proposed. The stormwater modifications to Dingo Dam, within the ML boundary, include:

- Creating a new spillway/channel through the Dingo Dam embankment in the east to direct overflow toward the existing grassed natural drainage path. The spillway will have a base width of 8.0 m (minimum) and slopes of 1:2H.
- Reinstating the Dingo Dam embankment in the north to match adjacent crest levels and slope using non-dispersive, low permeability earthen material and revegetate with grasses.

Table 26: Consequence category assessment (ATC Williams 2019d)

Structure	Failure to contain – seepage	Failure to contain – overtopping	Dam break	Overall consequence category	Regulated structure
Final void	NA	Low	NA	Low	No
Sediment dam		Low	Low	Low	No
Dingo Dam		Low	Low	Low	No

Water balance model

Water balance modelling for the site is discussed in section 3.5.8.3.

Site water quality

Water quality monitoring has been undertaken and will continue to be undertaken at the locations shown on Figure 18. Water quality monitoring undertaken for the site indicates that:

- Physico-chemical properties including pH, EC and sulphate concentrations are generally uniform and within the expected ranges across the receiving environment.
- Historical monitoring records indicate that turbidity in the Snake Creek receiving environment is variable and is often elevated during periods of flow. Slightly elevated turbidity levels both upstream

and downstream of the Project site have been attributed to local catchment conditions, in which the highly dispersive soils generate high sediment loads during flushing events.

- Surface water in the Lucky Break receiving environment, both upstream and downstream of the Project site, has exhibited elevated levels of dissolved aluminium. This is a consequence of the high suspended sediment loads and naturally high aluminium levels in the dispersive sediments of the Late Tertiary – Quaternary Alluvium.

In summary, water quality of the receiving environment is representative of natural mineralisation and the erosive nature of soils in the sub-catchment to the south and east of the Dingo Dam ML. Long-term water quality data from the downstream receiving environment demonstrate that surface water stored or released from the Project site poses no identifiable risk to downstream aquatic ecosystem values. Water quality in the receiving environment downstream of the Project site is consistent with background water quality as measured at upstream sites and/or at the time of the baseline sampling (2006).

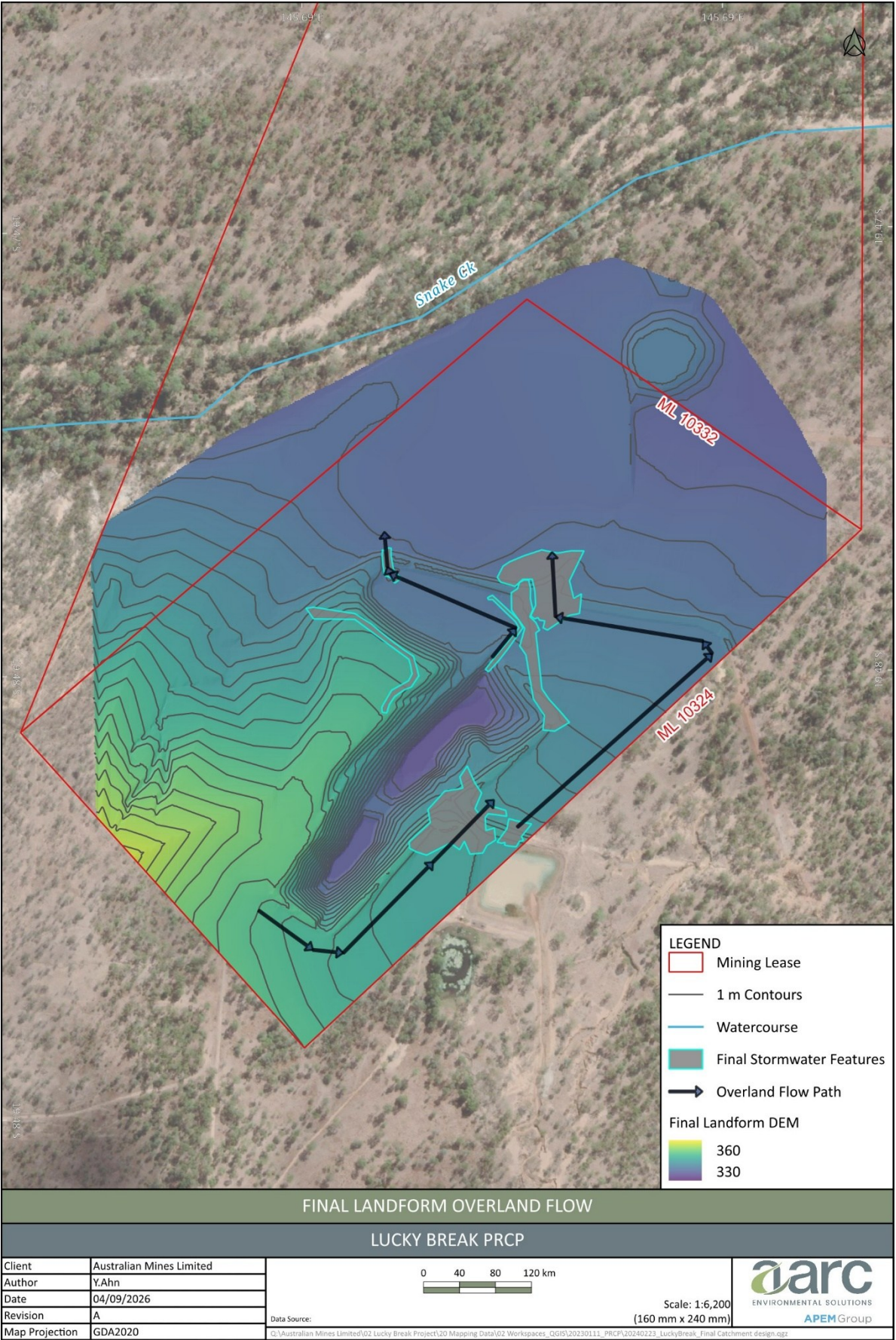


Figure 18: Final overland flow pathway



Figure 19: Water quality monitoring locations

3.5.8.5 Waste characterisation

Geochemical assessment of the Dingo Dam lateritic ore body was undertaken during the Project's exploration phase. Samples were collected from the waste rock zone of the Dingo Dam deposit. The samples were sent to a NATA accredited laboratory for analysis to determine the acid producing potential of the waste rock material.

Analysis results demonstrated that the waste rock material is non-acid forming due to a negative net acid producing potential. Total sulphur concentrations also fell below detection limits, indicating that waste rock does not pose a threat from acid rock drainage.

The geochemical assessment identified significant nickel enrichment. The main phyllosilicate minerals such as smectite, chlorite, talc and serpentine were identified as likely to host the nickel mineralisation with chlorite and smectite being preferred (GeoSquare 2019).

3.5.8.6 Soil and capping material assessment

The majority of the Project site is covered by two alluvial soil types known as the Barkla association and the Cape association (refer section 3.1.7). Two other soil types cover the remaining small areas, which include the Conolly association and the Corea association. The Conolly unit is restricted to the western edge of Dingo Dam ML (ML 10324), and the Corea unit forms the lateritic clay outcrops of the protruding ore bodies on the Project site.

As described in the soils and land suitability assessment (SLSA) (AARC 2006a), Soil Type 3 (the Conolly association) lacks soil structure, is low in nutrients and has other characteristics unfavourable for use in rehabilitation.

Topsoil on the Project site was of sufficient depth and quality to enable stripping to occur to a depth of 300 mm and once stripped, was stored in stockpiles, prior to use in the rehabilitation program.

Early (pre-AUZ) management plans recommended use of a phosphorus-based fertiliser for topsoils due to the low phosphorus levels present in all soils within the Project site (AARC 2006a). An assessment of soils used in existing rehabilitation areas against reference sites, indicated that soils in some rehabilitation activities were of a poorer quality and as such, early revegetation progress in these areas has been less rapid than in other areas.

The minor revegetation mitigation works currently proposed will utilise hydroseeding methods to negate any further disturbance associated with obtaining topsoil materials.

3.5.8.7 Cover design

The geochemical assessment undertaken (GeoSquare 2019) determined the waste rock material to be non-acid-forming due to its negative net acid producing potential. As such, the capping design understood to have been utilised was restricted to topsoiling and vegetation establishment as follows:

- Once final outer embankment slopes were constructed to their final slope geometry, progressive armouring with Barkla subsoil and capping with Barkla topsoil was carried out.
- Barkla topsoil was spread to a depth of 150–200mm in areas being rehabilitated and deep ripping (500 mm) of the surface was understood to have been undertaken prior to spreading topsoil to assist in combining topsoil with the subsoil.

Site investigations undertaken since 2018 suggest that topsoil material was likely sourced from one of the topsoil stockpiles stripped from the Corea, Cape or Barkla soil units prior to the commencement of mining. The topsoil was applied across the mine disturbance areas (pit void, WRD and ROM pad).

Black chromite grains are present in the soils of the Project region and reflect the insoluble nature of chromite in the laterite environment. The presence of chromite is evident in the elevated chromium levels

since recorded in the WRD topsoil. Levels of cobalt and nickel are also elevated due to the naturally high levels present in Corea topsoils and subsoils as shown in the geological testing conducted at the time of exploration activities (AARC 2019a).

Given that the elevated metals in the WRD soils are naturally high in the surface and subsoils overlying lateritic outcrops, the WRD is considered to present a minimal risk of causing environmental harm to the receiving environment.

3.5.8.8 Built infrastructure

The haul road was retained at the completion of mining. Retention of this structure needs to be confirmed with the present owner. If this structure is to be rehabilitated, this will require ripping, grading and seeding.

The ROM pad was a levelled area immediately to the northeast of the WRD used for storing, crushing, screening and load-out of ROM product. Similarly, the office area was a levelled site to the north-east of the void used for and housing a secondary bunded fuel tank, storage containers, two demountable offices and an ablution demountable, a shipping container dome shed used as a workshop and various other miscellaneous materials. Rehabilitation of both areas involved removal of all infrastructure and product material and ripping to aid rainfall infiltration.

Dingo Dam is owned by the landowner and will remain as a water storage facility.

3.5.8.9 Revegetation

Surface preparation

It is understood that placement of topsoil occurred at a thickness of approximately 0.2 m across rehabilitated areas, to create a growth medium of sufficient depth to hold water and support revegetation. Site investigations indicated that topsoil was likely sourced from the Corea, Caper or Barkla soil units (AARC 2019a). Ripping of the surface occurred prior to spreading topsoil to allow the subsurface and topsoil materials to blend and to minimise the potential for a hardpan layer to form under the topsoil. Grass and woody vegetation remaining after land clearing was incorporated into the rehabilitation at specific locations to help limit run-off and erosion, retain active biological activity and provide habitat for returning fauna.

Prior to the placement of topsoil, constructed landforms such as the ROM pad were re-contoured to resemble the original local topography as far as practicable.

Landforms were deep ripped to a depth of 0.5 m where required to alleviate compaction prior to seeding.

Species mix and application

From available records, native plant species known to succeed under a grazing land use have been used for rehabilitation. Species within the underlying vegetation communities mapped across the Project area pre-mining (AARC 2006b), the selected PMLU and species recorded within reference sites during site surveys were also understood to have been considered when determining species to use in revegetation works.

Where low intensity grazing and grassland PMLU areas are to be revegetated following the commencement of the PRCP schedule, seed selection shall be based on the relevant suite of species, as recommended in Table 27 and Table 28 respectively. Species to be used in any reparation activities will be nominated from this list, but agreement of the landowner will be sought prior to any revegetation activities occurring. Revegetation of disturbed areas was undertaken by direct seed application using either manual or mechanical techniques.

The seed mixes are intended to guide species selection during rehabilitation, with seeding undertaken using a selection of the recommended species, noting that species selection may be limited by seed availability at the time of rehabilitation. The respective species selection lists support the establishment of vegetation appropriate to the intended low intensity grazing or grassland PMLU and provide the basis against which

vegetation outcomes are assessed. For low intensity grazing areas, species selection shall target at least three 3P grasses and three legume species, or as otherwise agreed with the landholder.

Table 27: Species selected for low intensity grazing

Species name	Common name
Shrubs and trees	
<i>Neptunia dimorphantha</i>	Sensitive Plant
<i>Acacia holosericea</i>	Silver Wattle
<i>Breynia oblongifolia</i>	Coffee Bush
<i>Sida subspicata</i>	Spiked Sida
<i>Carissa lanceolata</i>	Currant Bush
Grasses	
<i>Heteropogon contortus</i> ¹	Black Spear grass
<i>Aristida calycina</i> var. <i>calycina</i>	Dark Wiregrass Aristida
<i>Melinis repens</i>	Red natal grass
<i>Themeda triandra</i> ¹	Kangaroo grass
<i>Chloris gayana</i> ²	Rhodes grass
<i>Urochloa mosambicensis</i>	Sabi grass
<i>Panicum decompositum</i> ¹	Native millet
Legumes	
<i>Rhynchosia minima</i> ³	Rhyncho
<i>Glycine tabacina</i> ³	Variable Glycine
<i>Desmodium trichostachyum</i> ³	

1 - Indicates a 3P species.

2 - Indicates an improved pasture species approved by the landholder.

3 - Indicates a legume species.

Table 28: Species selected for grassland land use

Species name	Common name
Native tree/ shrub	
<i>Acacia salicina</i>	Sally Wattle
<i>Acacia holosericea</i>	Silver Wattle
Native forb/ herbaceous	
<i>Stylosanthes scabra</i> ¹	Shrubby Stylo
<i>Glycine tabacina</i> ¹	Variable Glycine
<i>Rhynchosia minima</i> ¹	Rhyncho

Species name	Common name
<i>Achyranthes aspera</i>	Chaff flower
<i>Sida fibulifera</i>	Pin sida
<i>Stylosanthes hamata</i> ¹	Caribbean Stylo
<i>Phyllanthus maderaspatensis</i>	Spurge
<i>Sida hacketiana</i>	Queensland hemp
Native grass	
<i>Heteropogon contortus</i>	Blackheaded Speargrass
Pasture grass	
<i>Chloris gayana</i>	Rhodes grass
<i>Melinis repens</i>	Red Natal
<i>Bothriochloa pertusa</i>	Indian Bluegrass

1 - Indicates a legume species.

3.5.8.10 Exploration disturbance

Exploration disturbance was rehabilitated by capping drill holes, scarring the disturbance area and allowing natural regeneration to occur (Metallica Minerals 2011). Exploration disturbance (not within the mine path) was limited to 169 drill holes or approximately 4.8 ha. Recent site inspections indicated that these areas have successfully rehabilitated. Rehabilitation success in these areas will be assessed against the provisions in the 'Eligibility criteria and standard conditions for exploration and mineral development projects' or its successor, in accordance with PRCP condition PRCP10.

3.6 Risk assessment

3.6.1 Risk assessment requirements

Section 126C(1)(f) of the EP Act requires the PRCP to identify the risks, for each PMLU, of a stable condition not being achieved and how the applicant intends to manage or minimise the risk.

A risk assessment has been carried out in accordance with the following standards:

- AS/NZS ISO 31000:2018 Risk management - Guidelines; and
- HB203:2012 Managing environment-related risk.

3.6.2 Risk assessment process

Any risk assessment needs to be undertaken with consideration of the scope, context and criteria relevant to the assessment. For this risk assessment, the following scope and purpose was discussed and agreed to:

The purpose of this risk analysis is to identify the risks of a stable condition for land not being achieved for the agreed PMLUs nominated, and the approach to be taken by the Project to manage and minimise the risks identified.

For this risk assessment, risk scenarios (or 'threats') were identified and considered for each RA and NUMA associated with the Project. The causes attributable to each risk scenario were documented as well as the

potential impacts. Existing controls were noted, defined as those reasonably expected to be in place for a Project of this nature and having appropriate and contemporary management systems. Each risk scenario was then assessed with respect to health, safety, the environment and compliance against the risk assessment schema outlined in section 3.6.3.

3.6.3 Risk assessment schema

Risks specific to the rehabilitation of the Project were classified using the risk classification schema which is described below. The risk assessment schema used is comparable to those used widely within the mining industry and comprises the following components:

- a control effectiveness ranking table (Table 29) was used for assessing the operational controls expected to be in place for a project of this type;

a likelihood classification descriptors table (

- Table 30); and
- a consequence classification descriptors table (Table 31) intended to guide a consistent assessment of consequence.

Following a consensus determination of likelihood and consequence, the risk level was determined using the matrix shown in Table 32. For any risks classified as 'significant' or above, mitigation and management measures were identified and documented. Mitigation and management measures were also documented for some lower-level risks.

Table 29: Control effectiveness ranking

Control Rank	Description	Guidance
C1	Substantially effective/adequate design	Controls considered adequate and are operating effectively on almost all occasions
C2	Mostly effective/adequate design	Controls considered adequate and are operating effectively on most occasions
C3	Inadequate design/partially effective	Controls considered partially adequate or are only operating to partial effectiveness on most occasions
C4	No controls/ineffective	There are no controls, or the existing controls are operating ineffectively on all occasions

Table 30: *Likelihood of exposure to the hazard*

Level of Risk Probability	Descriptive Guidance	Probability	Frequency
Highly Likely	The event is expected to occur in most circumstances	Higher than 80%	The event and consequence are expected to occur at least once per year
Likely	The event will probably occur in most circumstances	From 33% up to 80%	The event and consequence are expected to occur at least once in 1 to 3 years
Possible	The event could occur at some time	From 5% up to 33%	The event and consequence are expected to occur at least once in 3 to 20 years
Unlikely	Not expected but the event may occur at some time in the future	From 1% up to 5%	The event and consequence are expected to occur at least once in 20 to 100 years
Rare	The event may occur only in exceptional circumstances	Less than 1%	The event and consequence are expected to occur less than once in every 100 years

Table 31: Consequence classification descriptors

Category	Consequence Scale				
	1. Very low	2. Low	3. Moderate	4. High	5. Very High
Health and Safety	- Reversible health effects of little concern - Low-level, short-term subjective symptoms - First aid treatment	- Reversible health effects of concern - Medical treatment - Reversible injuries requiring treatment, but not leading to restricted duties	- Severe reversible health effects of concern - Lost time illness/injury - Reversible injury or moderate irreversible damage to one or more persons	Single fatality or irreversible health effects or disabling illness or severe impairment to one or more persons	Multiple fatalities or serious disabling illness to multiple people
Environmental	Near-source confined and promptly reversible impact (typically for a shift)	Near-source confined and short-term, promptly reversible impact (typically for a week)	Near-source confined and medium-term recovery impact (typically for a month on-site and for a week off-site)	- On-site impact that is unconfined and requiring long-term recovery or residual impact - An off-site impact that is near source confined - recovery on-site that is years, or a month off-site	Impact that is widespread unconfined and requiring long-term recovery, leaving major residual damage

Table 32: Risk level classification matrix

Likelihood	Consequence				
	1. Very Low	2. Low	3. Moderate	4. High	5. Very High
A. Highly Likely	Class II	Class III	Class IV	Class IV	Class IV
B. Likely	Class II	Class III	Class III	Class IV	Class IV
C. Possible	Class I	Class II	Class III	Class IV	Class IV
D. Unlikely	Class I	Class I	Class II	Class III	Class IV
E. Rare	Class I	Class I	Class II	Class III	Class III

3.6.4 Risk assessment outcomes and management

A total of 30 risk scenarios or hazards were identified during the risk assessment process. Any identified Class III risks were then reassessed to identify if additional controls could be introduced to lower the risk ranking. No Class III risks were identified for the Project. Ten Class II risks were identified, occurring equally across all rehabilitation areas. The remaining 20 risks were ranked as Class I. The rehabilitation area featuring the ROM pad and WRD (i.e. RA3) had the most Class I risks, with 7 Class I risks identified in association with this domain.

The final outcomes of the risk assessment are detailed in Table 33, which provides a summary of the risk classification determinations for each rehabilitation area. The detailed risk assessment outcomes are included in Appendix F.

Table 33: Risk assessment outcomes by RA / IA

RA/IA	Risk level				
	Class I	Class II	Class III	Class IV	Total
RA1	4	2	0	0	6
RA2a	3	2	0	0	5
RA2b	4	2	0	0	6
RA3 (WRD)	7	2	0	0	9
IA1	2	2	0	0	4

3.7 Monitoring and maintenance

For the purpose of developing the PRCP schedule, three RMs and one MM have been proposed as being applicable to the Project. The PRCP Guideline (DES 2021) requires consideration of measures to be undertaken to demonstrate that milestones and milestone criteria have been achieved.

To date, all areas of the Project have undergone some form of rehabilitation, with future works limited to reparation, maintenance and monitoring activities.

Significant rainfall events, localised flooding, fire, drought, pest species outbreaks or other factors may result in a requirement to conduct remedial activities in rehabilitated areas beyond general maintenance and planned remediation works. If maintenance is required, maintenance activities will be developed with consideration to the risks of re-entering a rehabilitated area with earthmoving equipment, the sourcing of soils and topsoil, impacts on planned drainage of the site, erosion controls and revegetation methods.

Table 34 provides a summary of the measures to be undertaken with respect to determining the achievement of each rehabilitation milestone.

3.7.1 Monitoring program design

The RMP is designed to assess rehabilitation progress to effect acceptance of rehabilitation works by the administering authority and to support surrender of the MLs. A key component of the assessment will be to provide sufficient comparison between rehabilitated areas with surrounding non-mined lands of a similar PMLU. A rehabilitation monitoring and maintenance program for each milestone is provided in Table 34.

Monitoring of rehabilitation progress has been carried out in 2018 and 2022, with an additional monitoring event to be undertaken prior to rehabilitation certification and surrender of EA. An RMP was developed and submitted to the administering authority in 2020 as an appendix to the PMLUP. The objectives of the RMP are to assess rehabilitation progress against the completion criteria proposed in the PMLUP. The RMP will continue to be used to monitor rehabilitation progress against the milestone criteria proposed in Table 17 and Table 24.

The RMP is provided in full in Appendix D and a summary of the program is provided below.

The RMP focuses on the following environmental aspects considered to cover the rehabilitation objectives discussed in section 3.5.1:

- vegetation cover and composition;
- soil erosion rates;
- surface water quality;
- stream sediment quality; and
- baseline soil characteristics.

To address the characteristics associated with the variation in disturbance type between ML 10324 and ML 10332, the RMP has been designed with two programs (one for each ML). The RMP describes:

- analogue sites;
- rehabilitation monitoring locations;
- monitoring methods; and
- analysis procedures.

The RMP aims to achieve data collection at sufficient spatial and temporal resolution to ensure statistically valid results. The following methods are employed;

- permanent vegetation monitoring transects (ground cover monitoring and species richness);
- photographic monitoring;
- erosion monitoring;
- fauna utilisation;
- topsoil characterisation (prior to rehabilitation activities);
- water quality monitoring; and
- sediment stream monitoring.

Rehabilitation monitoring will be conducted at an appropriate frequency to analyse the progress of rehabilitated areas against milestone criteria. Monitoring will preferably be undertaken after the wet season to ensure the presence of ephemeral herbaceous plants and to assist with identification of species that require the presence of flowers/fruitlet material for accurate identification.

Monitoring frequency will be determined such that sufficient replication will enable statistical analysis of results at an acceptable power. It is important for analogue sites to remain fortified in order to provide a temporally consistent dataset better able to assess rehabilitation performance against success criteria for the duration of the RMP. Further detail regarding rehabilitation monitoring procedures is described in section 3 of the Project's RMP (Appendix D).

Additional rehabilitation monitoring activities are proposed to ensure compliance with the most recent monitoring standards and guidelines. The additional activities include monitoring of vegetation cover using satellite-derived fractional vegetation cover for ML 10324 as described in section 3.7.2.

3.7.2 Satellite-derived fractional vegetation cover ML 10324 (Dingo Dam)

To align with contemporary rehabilitation monitoring methods and provide further evidence of rehabilitation success and land stability, fractional vegetation cover (FVC) surveys are proposed.

FVC is defined as that fraction of a satellite imagery pixel representing ground condition across three ground cover classes being:

- 1) photosynthetic vegetation;
- 2) non-photosynthetic vegetation; and
- 3) bare ground.

A median value of FVC can be determined for all satellite imagery pixels within a defined polygon area (or set of combined polygons). Subject to certain limitations, a median FVC value can be determined for polygons enclosing a rehabilitation area which is then able to be compared with polygons enclosing a reference/analogue area that is representative of unmined land having similar landform, land cover and land use.

Satellite-derived indices will be reported annually based on one imagery acquisition per calendar month (12 per annum). Except where cloud cover or cloud shadow occlude the study area in a calendar month, imagery of the study area and acquisition metadata are assessed.

FVC is reported in graphical form with median and interquartile ranges for each rehabilitation polygon and combined reference area polygons. In addition, dates and duration of failure to achieve the target are reported in tabular form with mapping information for sources of non-compliance.

3.7.2.1 Source data:

Satellite imagery from the Sentinel 2 global earth observation mission acquires imagery on a 5–12-day interval at wavelengths between 400–2,500 nm. Reflectance indices based on the spectral reflectance profiles of photosynthetic vegetation, non-photosynthetic vegetation and bare ground is calculated and directly correlated with field-collected data to calculate FVC for each rehabilitation and reference polygon. Field calibration and validation are required to be re-established if a significant disturbance occurs (e.g., fire/drought).

3.7.2.2 Calibration and validation:

Calibration and validation of FVC is to be conducted during annual fixed transect monitoring using either (a) point intercept transects per Muir *et al.* (2011) modified to 50 m or (b) sub-10 cm UAV imagery captured as 1 ha blocks ISODATA clustering and supervised spectral class assignment provide FVC where UAV imagery is available.

3.7.3 ML 10332 (Lucky Break) monitoring program

Disturbance on the Lucky Break ML has been limited to historic exploration activities. Areas disturbed by exploration activities have been rehabilitated and show good vegetation cover (Figure 20 and Figure 21). Given the limited disturbance and time lapsed, photographic monitoring as described in section 3.2.5 of the PMLUP will be used to demonstrate success against the completion criteria.

3.7.4 Maintenance

Rehabilitation indicators and visual observations will be used to identify any aspects of the rehabilitated area that are of concern or suggest rehabilitated land is not on a trajectory of meeting the required completion criteria. These may include:

- evidence of active erosion;
- inadequate vegetation cover or growth;
- invasive weed or pest species;
- soil dispersion / instability; and
- soil infertility.

Following the annual monitoring process, areas of rehabilitation will be assessed for maintenance. An annual visual inspection of all rehabilitated areas will be undertaken to provide an overview of the status of the rehabilitation and identify any noticeable issues such as erosion or inadequate vegetation cover or growth. This information, along with monitoring results, will be used to inform the maintenance schedule.

Maintenance may include repairing areas of excessive soil erosion or undertaking supplementary plantings or seeding to increase floristic diversity and cover to assist in achieving completion criteria.

If issues re-occur, an investigation will be carried out to determine the reason and allow for remediation. Modification of rehabilitation methods and specifications may be required, and rehabilitation and maintenance planning updated accordingly.



Figure 20: North REF 1 monitoring location March 2022



Figure 21: DRILL 1 monitoring location March 2022

Table 34: Rehabilitation monitoring and management program for RAs and IA

Milestone reference	Applicable RA/IA	Milestone criteria	Monitoring methodology	Sampling design / replication	Timing / frequency
RM1 – Legacy rehabilitation works (reshaping, surface preparation, revegetation) completed.	RA1 RA2a RA3	a) With the exception of any infrastructure to remain as part of the post-mining land use (PMLU) or where infrastructure is agreed to be retained by the landholder as evidenced by a signed landholder agreement, the following are complete: i. All services disconnected, terminated and removed. ii. All buildings and associated infrastructure dismantled and removed offsite. iii. All hardstand, concrete areas and roads (bitumen, blue metal, aggregate etc.) removed. iv. All machinery and equipment removed from site. b) Reparation work undertaken after the date this transitional PRCP takes effect will include: i. Soil health, amelioration requirements and suitability are assessed and documented by an AQP⁽¹⁾ and confirm that the soil characteristics are suitable for the PMLU and target vegetation. ii. Seeding completed in Grazing PMLU areas using a section of the recommended species listed in Table 4 Grazing Species Mix. iii. Seeding completed in Grassland PMLU areas using a selection of the recommended species in Table 5 Grassland Species Mix. c) An AQP¹ certifies that all rehabilitation works required for this RM have been completed.	- Soil sampling to demonstrate no limiting soil characteristics. - Observations demonstrate no remaining plant, equipment or materials on the ML. - Recording/reporting of any supplementary or mitigating planting / seeding that has been undertaken.	- Topsoil sample results. - Spatial dataset. - Photographs.	At least one final rehabilitation monitoring event.
RM2 – Contaminated land status	RA1	a) Contaminated Land Investigation Document completed in accordance with the Environmental Protection Act 1994, including a site investigation report, and, where required, a Validation Report and/or a draft Site Management Plan. b) A declaration from a suitably qualified person (SQP⁽²⁾) confirms that no contamination unsuitable for the post-mining land use remains.	Provide certification from an AQP¹ confirming that land is suitable for intended activities as per the PMLU.	N/A	As soon as possible.
RM3 - Completion of all required stormwater management works.	RA1 RA2b	a) The PRCP schedule holder must provide to the administering authority a justification for all variations made to the Stormwater Management Plan (ATC Williams 2019). b) A report prepared by an AQP verifying that the final stormwater management arrangement for the site achieves the objectives stated in Section 4.1 of the Stormwater Management Plan (ATC Williams 2019).	- Certification by a AQP¹, stating that stormwater works have been constructed as per design and any landholder feedback. - GIS data indicating the location of stormwater management works. - Records of stormwater management earthworks and revegetation works.	- Report outlining works undertaken, locations and photographs. - Spatial dataset showing works locations.	Following completion of stormwater management works.
RM4 – Achievement of surface requirements	RA1 RA2a RA2b RA3	a) With respect to erosion: i. No evidence of erosion classified as ‘moderate’ or ‘severe’ as defined by the Erosion classification framework⁽⁹⁾; and ii. Erosion requiring intervention has been remediated and does not impact achieving the outcome in RM4(a)(i). b) RA2A sediment dam – an AQP⁽¹⁾ certifies that: i. Water quality does not exceed the ANZECC/ARMCANZ (2000) Livestock Drinking Water Quality Guideline limits; and ii. Sediment samples as not containing contamination unsuitable for the post-mining land.	- Surface water quality monitoring at water quality monitoring locations specified in the EA and RMP. - RMP transect methodology and general observations. - Erosion monitoring to be conducted at rehabilitation sites and general observations of ‘Severe’ erosion across each RA are to be recorded as per the RMP. Extent of erosion features and severity rating recorded across 50 m transect.	Visual assessment conducted along each permanent 50 m transect to detect any existing or new erosion features. General observations of severe erosion (i.e., tunnels, mass wasting, large gullies) outside the transect are also recorded.	At least one final rehabilitation monitoring event prior to milestone completion date.

Milestone reference	Applicable RA/IA	Milestone criteria	Monitoring methodology	Sampling design / replication	Timing / frequency
RM5 – Achievement of grassland PMLU to a stable, safe and non-polluting condition (ML 10324)	RA3	a) Hazard and safety assessment completed by an AQP⁽¹⁾ demonstrates hazards in rehabilitation areas are consistent with the type and severity of hazards typical of neighbouring equivalent land use. b) An AQP is to undertake an assessment of the available body of surface water quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream water quality complies with the limits in Table 1 – Surface water quality limits. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). c) If surface water quality exceeds criterion b) the applicable upstream site (Table 2) must be compared to the downstream site results; and quality measured at a downstream site must be equal to or less than the quality measured at the applicable upstream site⁽⁷⁾. d) An AQP is to undertake an assessment of the available body of sediment quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream sediment quality complies with ANZECC/ARMCANZ (2000) Interim Sediment Quality Guidelines – low. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). e) Restrictive invasive plants (as defined in the Biosecurity Act 2014) comprise less than 5% of vegetation ground cover. f) Total percentage of ground cover is $\geq 65\%$, where ground cover is defined as the cover of live plants, organic material (i.e. plant and leaf litter, twigs and woody debris) and rocks capable of protecting the soil surface from erosion. g) A species presence that is predominantly consistent with the grassland rehabilitation species mix provided in Table 5 – Grassland Species Mix. h) As determined using the satellite-derived fractional vegetation cover method⁽³⁾, rehabilitation polygons have a median fractional vegetation cover equal to or greater than 50% established and persistent groundcover⁽⁵⁾ at 30 September of each calendar year. i) Landholder agreement, transferring ownership and liability of the site agreed and signed by all relevant parties. j) Standard barbed wire fencing, with four barbed wire stands and the use of strainers as required have been erected around the perimeter of the grassland PMLU areas to prevent access by livestock. k) Waste rock dump assessed to be geotechnically stable by an AQP⁽¹⁾ and achieve a factor of safety of ≥ 1.5.	- Photographic database - Satellite imagery from the Sentinel 2 global earth observation mission acquires imagery on a five to 12-day interval at wavelengths between 400-2500nm. Reflectance indices based on the spectral reflectance profiles of photosynthetic vegetation, non-photosynthetic vegetation and bare ground will be calculated and directly correlated with field-collected data to calculate fractional vegetation cover for each rehabilitation and reference polygon. - Surface water and sediment quality monitoring at water quality monitoring locations specified in Figure 15. - RMP transect methodology and general observations. - Hazards to be assessed by an AQP¹ as part of a Hazard and Safety Assessment. - Landholder agreement.	- Satisfactory Final Rehabilitation Report. - Satellite imagery from the Sentinel 2 global earth observation mission. Calibration and validation of fractional cover will be conducted during the rehabilitation monitoring event. - Visual inspection to be conducted throughout rehabilitation areas to identify any remaining hazards or safety concerns.	At least one final rehabilitation monitoring event prior to milestone completion date.

Milestone reference	Applicable RA/IA	Milestone criteria	Monitoring methodology	Sampling design / replication	Timing / frequency
RM6 – Achievement of low intensity grazing PMLU to a stable, safe and non-polluting condition (ML 10324)		a) Hazard and safety assessment completed by an AQP⁽¹⁾ demonstrates hazards in rehabilitation areas are consistent with the type and severity of hazards typical of neighbouring equivalent land use. b) An AQP is to undertake an assessment of the available body of surface water quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream water quality complies with the limits in Table 1 – Surface water quality limits. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). c) If surface water quality exceeds criterion b) the applicable upstream site (Table 2) must be compared to the downstream site results; and quality measured at a downstream site must be equal to or less than the quality measured at the applicable upstream site⁽⁷⁾. d) An AQP is to undertake an assessment of the available body of sediment quality data collected at, but not limited to, downstream locations specified in Table 2 and Figure 3 – Surface Water and Stream sediment Monitoring Sites, demonstrating that downstream sediment quality complies with ANZECC/ARMCANZ (2000) Interim Sediment Quality Guidelines – low. The assessment must take into account the catchment conditions prior to the completion of the stormwater management works (December 2022). e) Restrictive invasive plants (as defined in the Biosecurity Act 2014) comprise less than 5% of vegetation ground cover. f) Non-palatable weed presence is a maximum of 10% of total vegetative groundcover confirmed by an AQP⁽¹⁾ in annual monitoring. Weed management recommendations to be provided in annual reports. g) Excluding RA2A, for areas where slopes are less than 10%, rehabilitation polygons have a median fractional vegetation cover greater than the first quartile of reference polygons (Table 3) for at least 85% of all sample time, as determined using the satellite-derived fractional vegetation cover method⁽³⁾ and greater than 50% established and persistent vegetation groundcover⁽⁵⁾ at 30 September of each calendar year. h) Vegetation species diversity includes at least 3 desirable perennial pasture species (3P grasses) and 3 legume species or as agreed to by the landholder. i) All infrastructure to be retained for landholder use meets the requirements of conditions set out in the landholder agreement.	• Photographic database • Satellite imagery from the Sentinel 2 global earth observation mission acquires imagery on a five to 12-day interval at wavelengths between 400-2500nm. Reflectance indices based on the spectral reflectance profiles of photosynthetic vegetation, non-photosynthetic vegetation and bare ground will be calculated and directly correlated with field-collected data to calculate fractional vegetation cover for each rehabilitation and reference polygon. • Surface water and sediment quality monitoring at water quality monitoring locations specified in Figure 15. • RMP transect methodology and general observations. • Hazards to be assessed by an AQP¹ as part of a Hazard and Safety Assessment. • Landholder agreement.	• Satisfactory Final Rehabilitation Report. • Satellite imagery from the Sentinel 2 global earth observation mission. Calibration and validation of fractional cover will be conducted during rehabilitation monitoring event. • Visual inspection to be conducted throughout rehabilitation areas to identify any remaining hazards or safety concerns.	• At least one final rehabilitation monitoring event prior to milestone completion date.
MM1 - Achievement of final landform design and surface and safety requirements. Achievement of sufficient improvement with respect to overtopping risk.	IA1	1.a) Final void landform with overall slopes less than 22 degrees as certified by an AQP⁽¹⁾. 1.b) Void assessed to be geotechnically stable by an AQP⁽¹⁾ and achieve a factor of safety of ≥ 1.5. 1.c) AQP⁽¹⁾ has certified i. that the pit void is not connected to snake creek or other surface waters via the alluvium. ii. that appropriate erosion control measures are in place to minimise erosion. iii. erosion within the NUMA area will not negatively impact on the adjacent rehabilitation areas, or their ability to sustain their PMLU. 1.d) Fencing installed commensurate to the risks assessed.	• Utilise digital terrain model to demonstrate void batter slopes meet criteria. • Geotechnical assessment completed by an AQP¹ assessing the factor of safety for the final landform. • Final void water assessment completed by an AQP¹. • Photographic record of fencing construction and signage installed; assessment by an AQP¹ indicating that safety barriers and signage meets guideline requirements. • Visual inspection and assessment by an AQP of erosion within the NUMA area and the effectiveness of erosion control measures, including potential impacts on adjacent rehabilitation areas.	• Spatial dataset showing works locations. • Report by AQP¹.	• Upon completion of works.

Milestone reference	Applicable RA/IA	Milestone criteria	Monitoring methodology	Sampling design / replication	Timing / frequency
		1.e) Safety signage designed in accordance with Australian Standard is erected at 100m intervals along the fence line. 1.f) Having considered an appropriate water quality data set, and modelling certification from an AQP ⁽¹⁾ that: i. the residual void will not cause material environmental harm outside of the relevant tenure boundary; and ii. that appropriate controls are in place to ensure that water quality from the void does not impact the adjoining low intensity grazing land use.			

1. AQP means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods, or literature.
2. Suitably qualified person (SQP) for performing a regulatory function under chapter 7, part 8 (Contaminated Land) of the EP Act or another function prescribed under a regulation, means a person who:
 - has qualifications and experience relevant to performing the function; and
 - if a regulation prescribes an organisation for this paragraph – is a member of the organisation.
3. The method for satellite-derived fractional vegetation cover is outlined in 3.7.2 of the PRC Plan version 4 dated 30 October 2023
4. Excluding the typical inundation extent at the sediment dam. These areas will frequently experience die-off and regrowth resulting from inundation events.
5. Ground cover means plants, plant litter, tree leaf litter, twigs and woody debris capable of protecting the soil surface from erosion.
6. Environmentally problematic materials means waste rock or processing materials that include one of the following characteristics: Potentially Acid Forming (PAF), saline, sodic, dispersive, high metal/metalloid concentrations and solubility.
7. For pH, the quality result measured at the downstream location must be within the prescribed range. However, where pH at the downstream location is greater than (>) the highest limit in the range, the pH at the applicable upstream location must be greater than or equal to (≥) the downstream location. Conversely, where pH at the downstream location is less than (<) the lowest limit in the range, the upstream pH at the applicable upstream location must be less than or equal to (≤) the downstream location.
8. Definition of stabilised:
 - One or both of the following conditions apply:
 - no evidence of sediment movement;
 - sides and/or floors of erosion form are revegetated.
9. Erosion classification:

Erosion classification	Minor	Moderate	Severe
Sheet erosion	Shallow soil deposits downslope	Partial exposure of roots; moderate soil deposits downslope	Loss of surface horizon; subsoil exposure; root exposure; substantial soil deposits downslope
Rill per 50 m transect	<15 rills pre transect*	15-30 rills per transect*	>30 rills per transect*
Gully erosion per 50 m transect	Absent	Absent	Present
Tunnel erosion	Absent	Absent	Present
Mass movement	Absent	Absent	Present

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Appendix A. PRCP Schedule

Post-mining land use											
Rehabilitation area			RA1								
Relevant activities			Mine infrastructure area								
Total size of rehabilitation area (ha)			2.3								
Commencement of first milestone: RM1			1/01/2023								
PMLU			Low intensity grazing								
Date area is available	1/01/23	10/12/26									
Cumulative area	2.3	2.3									
Milestone completed by	10/12/26	10/12/30									
Milestone reference	Cumulative area achieved (ha)										
RM1	2.3										
RM2	2.3										
RM3	2.3										
RM4		2.3									
RM6		2.3									

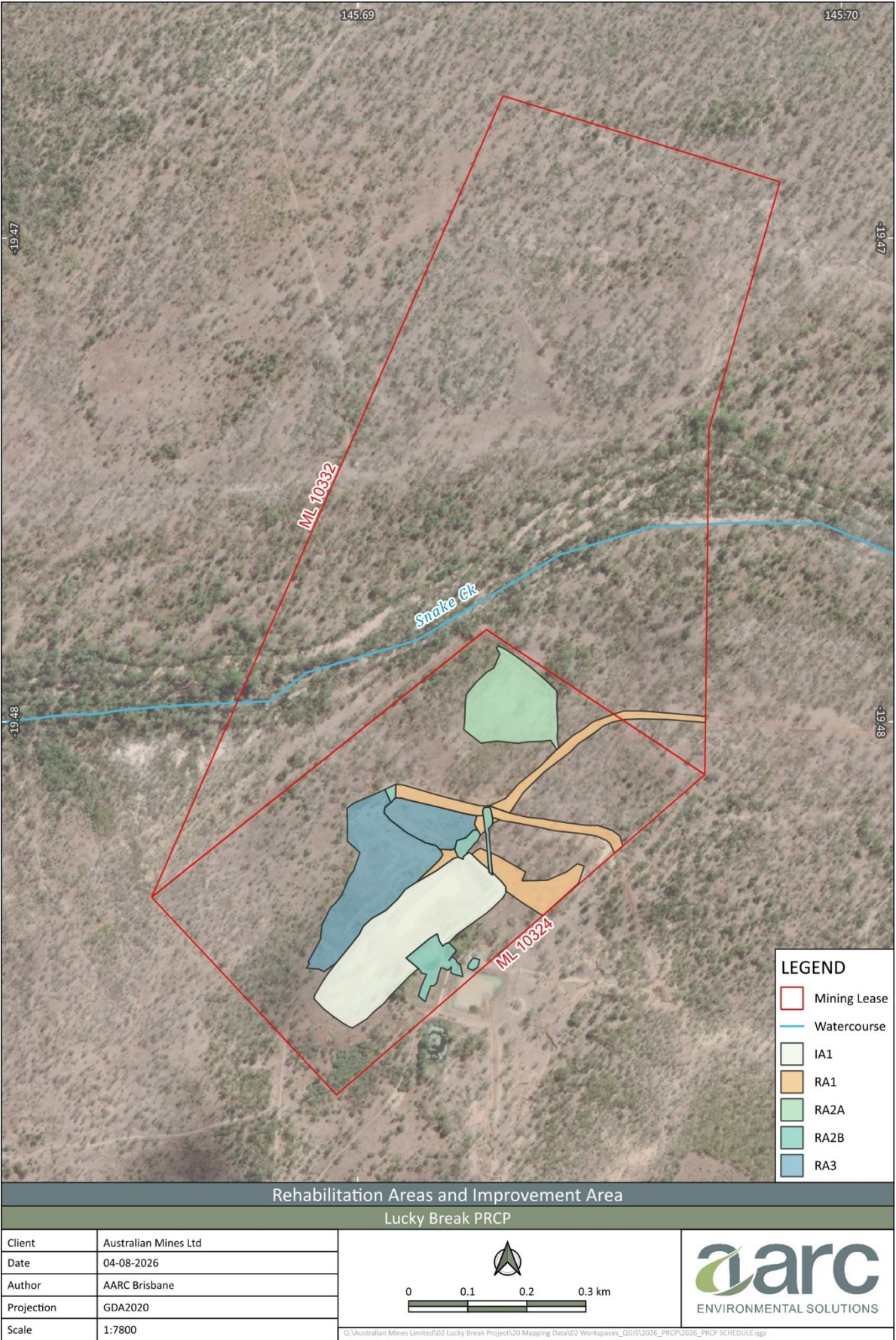
Post-mining land use											
Rehabilitation area			RA2a								
Relevant activities			Water management infrastructure – Sediment dam								
Total size of rehabilitation area (ha)			2.0								
Commencement of first milestone: RM1			1/01/2023								
PMLU			Low intensity grazing								
Date area is available	1/01/23	10/12/25									
Cumulative area	2.0	2.0									
Milestone completed by	10/12/25	10/12/27									
Milestone reference	Cumulative area achieved (ha)										
RM1	2.0										
RM4		2.0									
RM6		2.0									

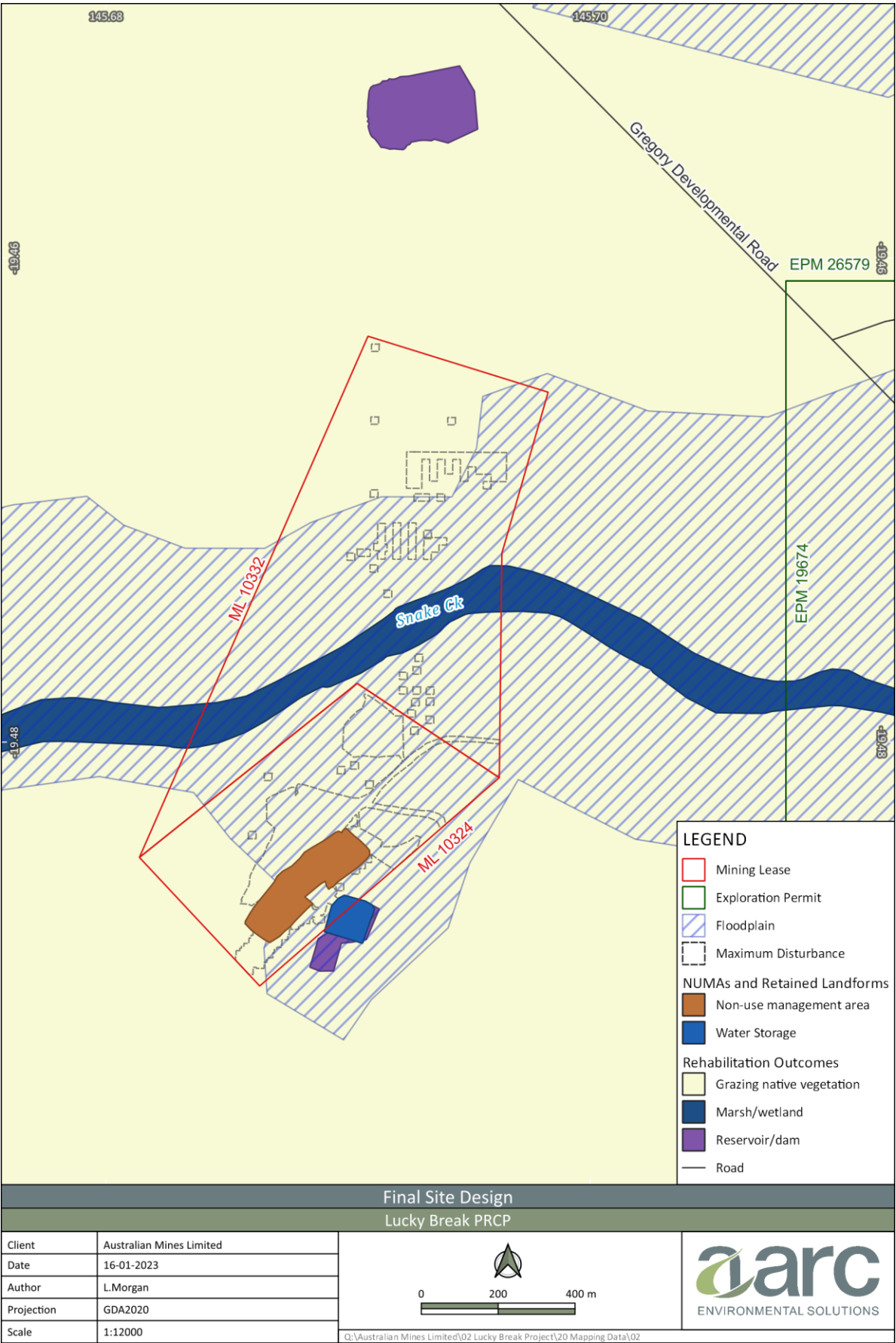
Post-mining land use											
Rehabilitation area			RA2b								
Relevant activities			Water management infrastructure – Stormwater management works								
Total size of rehabilitation area (ha)			0.75								
Commencement of first milestone: RM3			1/01/2023								
PMLU			Low intensity grazing								
Date area is available	1/12/23	10/12/26									
Cumulative area	0.75	0.75									
Milestone completed by	10/12/26	10/12/27									
Milestone reference	Cumulative area achieved (ha)										
RM3	0.75										
RM4	0.75										
RM6		0.75									

Post-mining land use											
Rehabilitation area			RA3								
Relevant activities			Waste rock dump & ROM Pad								
Total size of rehabilitation area (ha)			3.7								
Commencement of first milestone: RM1			1/01/2023								
PMLU			Grassland								
Date area is available	1./01/23	10/12/25									
Cumulative area	3.7	3.7									
Milestone completed by	10/12/25	10/12/27									
Milestone reference	Cumulative area achieved (ha)										
RM1	3.7										
RM4		3.7									
RM5		3.7									

Non-use management area											
Rehabilitation area			IA1								
Relevant activities			Final void								
Total size of rehabilitation area (ha)			3.9								
Commencement of first milestone: MM1			1/01/2023								
PMLU			NUMA								
Date area is available	1/01/23										
Cumulative area	3.9										
Milestone completed by	10/12/30										
Milestone reference	Cumulative area achieved (ha)										
MM1	3.9										

Appendix B. PRCP Reference Map and Final Site Design





Appendix C. Stakeholder Engagement Template

Community consultation register

Consultation date	Community members	Consultation type	Information supplied	Issues raised and discussed	Response and outcome

Appendix D. Rehabilitation Monitoring Program



REHABILITATION MONITORING REPORT LUCKY BREAK PROJECT

PREPARED FOR
AUSTRALIAN MINES LIMITED

OCTOBER 2023

Document Control

Project Name:	Lucky Break Project
Report Title:	Rehabilitation Monitoring Report
Client:	Australian Mines Limited
Project Manager:	Hollie Dick

Version	Comments	Author	Reviewer	Date
Draft issued for client review		NJ	SR	6 th August 2023
Final issued to client		NJ	SR	23 rd October 2023

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Table of Contents

1	Introduction	1
1.1	Scope.....	1
2	Project location and description	2
2.1	Background	2
3	Objectives, indicators and completion criteria	5
3.1	Rehabilitation legislation in Queensland	5
3.2	Site-specific EA conditions	5
3.3	Site-specific rehabilitation objectives	7
4	Previous monitoring	12
4.1	Rainfall and seasonal influences.....	12
4.2	Historic monitoring results	12
5	Methodology	13
5.1	Rehabilitation monitoring program design	13
5.2	Monitoring sites	13
5.3	Monitoring methodology	17
5.3.1	Dingo Dam (ML10324)	17
5.3.2	Lucky Break (ML10332)	21
6	Results and interpretation	22
6.1	Ground cover	22
6.2	Species richness.....	22
6.3	Restricted invasive plants	23
6.4	Fractional vegetation cover	29
6.5	Soils.....	37
6.6	Slope analysis	40
6.7	Erosion monitoring.....	44
6.8	ML10332 photographic monitoring	44
7	Conclusions and recommendations	50
8	References	52

List of Appendices

Appendix A. Field photographs

List of Figures

Figure 1:	Project locality	3
Figure 2:	Project layout	4
Figure 3:	Dingo Dam rehabilitation monitoring locations.....	15
Figure 4:	Lucky Break ML rehabilitation monitoring locations	16
Figure 5:	Ground cover percentage sampling.....	17
Figure 6:	Guide to monitoring canopy cover	18
Figure 7:	Void monitoring locations 2022	25
Figure 8:	FVC performance of the Diversion Bund rehabilitation area.....	31
Figure 9:	FVC performance of the Exploration Drilling rehabilitation area	32
Figure 10:	FVC performance of the Office rehabilitation area.....	33
Figure 11:	FVC performance of the ROM rehabilitation area	34
Figure 12:	FVC performance of the Sediment Dam rehabilitation area	35
Figure 13:	FVC performance of the WRD rehabilitation area	36
Figure 14:	Final landform slope analysis, cross-section locations.....	41
Figure 15:	Slope profile of the WRD.....	42
Figure 16:	Slope profile of the Void	43
Figure 17:	DRILL 1 monitoring location 2022	45
Figure 18:	DRILL 2 monitoring location 2022	46
Figure 19:	DRILL 3 monitoring location 2022	47
Figure 20:	NORTH REF 1 monitoring location 2022	48
Figure 21:	NORTH REF 2 monitoring location 2022	49

List of Tables

Table 1:	Project tenements.....	2
Table 2:	Rehabilitation requirements of the Project EA	6
Table 3:	Post-mining land uses	6
Table 5:	Applicable rehabilitation goals, objectives, indicators, and completion criteria	8
Table 6:	Revegetation and landform completion criteria.....	11
Table 7:	Rehabilitation monitoring locations.....	14
Table 8:	Erosion classification	19
Table 9:	Average ground cover at reference locations and completion criteria	24
Table 10:	Average ground cover at rehabilitation monitoring locations by mine domain	24
Table 11:	Average species richness by mine domain	26
Table 12:	Species recorded by domain	27
Table 13:	FVC-derived total cover statistics and performance against reference sites.....	30
Table 14:	Soil monitoring results 2022	38
Table 15:	Salinity ratings for soil based on EC _{SAT}	39
Table 16:	Ideal concentration ranges for trace elements/metals	39
Table 17:	Emerson aggregate test classes	40
Table 18:	Erosion monitoring results 2022	44
Table 19:	Achievement of revegetation and landform completion criteria	51

Table of Abbreviations

AARC	AARC Environmental Solutions Pty Ltd
AUZ	Australian Mines Limited Pty Ltd
EA	Environmental authority
EC	Electrical conductivity
FVC	Fractional vegetation cover
ML / MLs	Mining lease / mining leases
PMLU	Post-mining land use
PMLUP	Post-mining Land Use Plan
PRCP	Progressive Rehabilitation and Closure Plan
QNPL	Queensland Nickel Pty Ltd
RMP	Rehabilitation Monitoring Program
ROM	Run-of-Mine
Sconi	Sconi Mining Operations Pty Ltd
WRD	Waste rock dump

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) has been commissioned by Australian Mines Limited Pty Ltd (AUZ) on behalf of Sconi Mining Operations Pty Ltd (Sconi) to conduct the rehabilitation monitoring program (RMP) and prepare a summary report on the progress of rehabilitated sites at the Lucky Break Project (the Project).

The Project is located at the Spyglass Beef Research Station (Lot 1 on OC57) approximately 100 km north of Charters Towers and 140 km west of Townsville in north Queensland. The Spyglass Beef Research Station is now owned and operated by the Queensland Department of Agriculture and Fisheries. The Project incorporates two mining leases (MLs) identified as ML10324 and ML10332 and known as Dingo Dam and Lucky Break respectively, and which have a combined total area of approximately 103 ha.

The RMP has been designed to meet the requirements defined in condition C4 and Table C1—Rehabilitation Requirements of the Project Environmental Authority (EA) as well as the Progressive Rehabilitation and Closure Plan (PRCP) for the Project (AARC 2023).

The purpose of the RMP is to measure the performance of existing rehabilitation at the Project against the established objectives, indicators and completion criteria. The program provides recommendations where necessary to ensure long-term rehabilitation success.

1.1 Scope

This RMP provides a summary of rehabilitation performance, as well as a comparison of observed trends against previous monitoring events for rehabilitation areas. The following activities were undertaken as part of the scope of works:

- On-site rehabilitation monitoring undertaken in accordance with the Rehabilitation Monitoring Program design document (AARC 2020).
- Data analysis to evaluate the performance of existing rehabilitation through statistical analysis of ecological parameters.
- Reporting to document the performance of existing rehabilitation with respect to meeting the relevant rehabilitation goals, objectives, and completion criteria for the Project.

This RMP assesses rehabilitated areas on both the Dingo Dam and Lucky Break MLs.

2 Project location and description

2.1 Background

The Lucky Break Project is located at the Spyglass Beef Research Station, approximately 100 km north of Charters Towers and 140 km west of Townsville in north Queensland (Figure 1). The Project is a legacy mine site that is currently undergoing final rehabilitation, with no future disturbance, mining or processing activities proposed for the site. The Project incorporates two MLs identified as ML10324 ('Dingo Dam') and ML10332 ('Lucky Break'), with a combined area of 102.7 ha. The Project tenements are listed in Table 1 and shown on Figure 2.

Exploration activities were undertaken on the Lucky Break ML in 2004 and 2005 and associated disturbance has since been rehabilitated. No mining activities on this ML subsequently occurred.

Between March 2015 and July 2015 Queensland Nickel Pty Ltd (QNPL) mined approximately 114 kt (ore product tonnes) of nickel ore from the Dingo Dam deposit (ML10324) under EA EPML009007131 held by Nornico Pty Ltd. The mining campaign specifically targeted nickel ore within the deposit that was suitable for processing at the QNPL Refinery near Townsville. Nickel ore mined by QNPL was transported to Townsville in B-double trucks via the approved B-double route. Disturbances associated with the mining activity included a waste rock emplacement, run-of-mine (ROM) pad, the final Void, a Sediment Dam, an Office area, roads and tracks and earthen bunds and drains (Figure 2). The upstream dam referred to in this report as Dingo Dam and which is bisected by the ML boundary, is a pre-existing structure that is the property of the landholder.

At the completion of mining activities, QNPL commenced rehabilitation of the site including removal of infrastructure, re-profiling of the waste rock dump (WRD), reducing the batter angles of the final void, installing stormwater controls, ripping hardstand areas, spreading topsoil, seeding and installation of fences.

Table 1: Project tenements

Tenement	Permit name	Permit status	Grant date	Expiry date	Surface area (ha)	Real property description
ML10324	Dingo Dam	Granted	16/02/2005	28/02/2026	36.2	Lot 1 OC57
ML10332	Lucky Break	Granted	22/11/2007	30/11/2027	66.5	Lot 1 OC57



Figure 1: Project locality

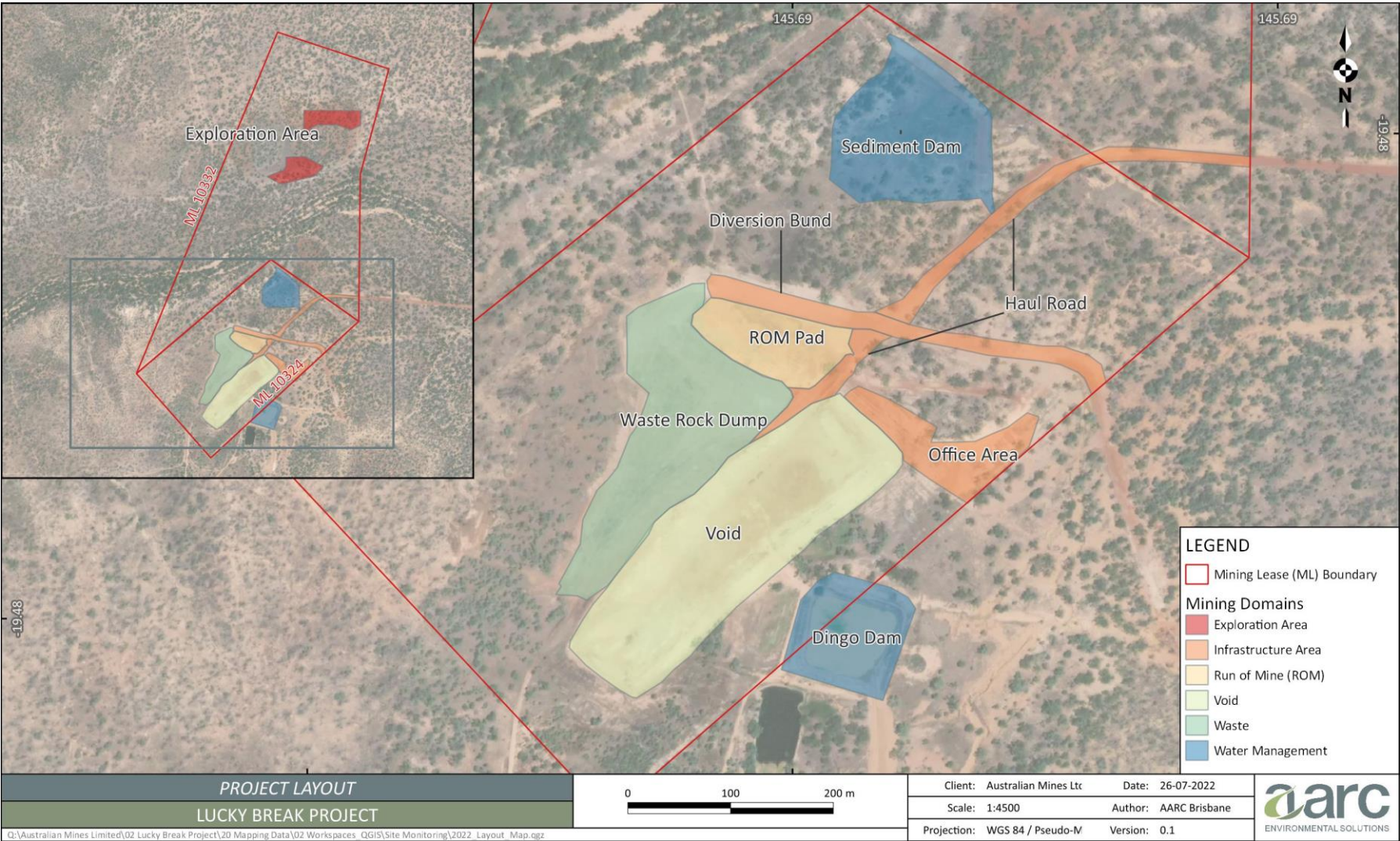


Figure 2: Project layout

3 Objectives, indicators and completion criteria

3.1 Rehabilitation legislation in Queensland

In Queensland, rehabilitation of mines is regulated under the *Environmental Protection Act 1994* (EP Act). The administering authority must be satisfied with the progressive rehabilitation undertaken before they can certify the rehabilitation or accept the surrender of an EA for the whole or part of a project. The administering authority must consider the relevant completion criteria when deciding whether to certify progressive rehabilitation or whether to approve a surrender application.

It is noted that as part of amendments made to the EP Act in 2019, all mining operations are required to have a PRCP, with existing mines required to transition from previous rehabilitation plans (including the Plan of Operations) to a PRCP. The PRCP introduces new requirements for the progressive rehabilitation and closure of mined land; establishing a schedule with time-based milestones for when activities are to be carried out, and rehabilitation criteria for each milestone.

The PRCP for the Project is currently in development and as such, this RMP will address current completion criteria. Going forward, rehabilitation monitoring programs will need to address the new PRCP milestone criteria, with minor updates to the Rehabilitation Monitoring Program made to version 2 of the Plan (AARC 2023).

3.2 Site-specific EA conditions

The EA (EPML00900713, issued on 26 October 2020 to Sconi Mining Operations Pty Ltd) for the Project includes conditions relevant to rehabilitation of the Project ML.

Schedule C and Table C1–Rehabilitation Requirements of the Project EA, identify the various disturbance types associated with the Project. In accordance with condition C4, a Post-Mine Land Use Plan (PMLUP) has been developed for the Project and was submitted to the administering authority on 3 July 2020.

In accordance with condition C1 of the EA:

Land disturbed by mining must be rehabilitated in accordance with Table C1-Rehabilitation Requirements

Table C1-Rehabilitation Requirements of the Project EA has been reproduced in Table 2 below. The PMLUs for the Project have been refined as part of the transition to the PRCP and are shown in Table 3.

However, the overall outcome of the PMLU remains consistent with the previous intent for the PMLU.

The PMLU of ‘grazing native ecosystem’ has been refined within the Project PRCP as ‘low intensity grazing’; consistent with the Queensland Land Use Mapping Series (DES 2017). This is defined as an ecosystem that is native to the local area and also capable of supporting low intensity cattle grazing. The intent for the vegetation community associated with PMLU is to:

- incorporate ground cover species at a sufficient density to support grazing but not out-compete native vegetation species in the area;
- promote long-term stability; and
- to provide some of the ecosystem functions of native ecosystems of the region including:
 - habitat for ground dwelling fauna;
 - food source for ground dwelling fauna and birds; and
 - habitat connectivity.

Table 2: Rehabilitation requirements of the Project EA (Schedule C, Table C1- Rehabilitation Requirements)

Mine domain and tenure	Mine feature name	Rehabilitation goal	Rehabilitation objectives, indicators and completion criteria
Dams ML10324, ML10332 ¹	Sediment Dam 1 Sediment Dam 2 ¹	All land subject to mining activities must be rehabilitated to meet the requirements of the administering authority guideline for Rehabilitation of Mining Projects and must be defined in the Post-Mine Land Use Plan (PMLUP).	To be provided in the PMLUP in accordance with Condition C4
Waste ML10324, ML10332 ¹	Overburden Dumps		
Run-of-Mine ML10324, ML10332 ¹	ROM pad Low grade ore stockpiles		
Ancillary Infrastructure ML10324, ML10332	Workshop Office Fuel storage Roads & Tracks Diesel Backup		
Voids ML10324, ML10332 ¹	Circular Laterite Pit ¹ Dingo Dam Pit		
Exploration ML10324, ML10332	Circular Laterite South-East Extension		
Mining area ML10324, ML10332 ¹	Topsoil Dumps		
Services ML10332 ¹	Waste Disposal Trench		

- Note that mining activities on ML10332 (Lucky Break) were limited to exploration activities only. Items marked with a superscript 1 are activities that were approved but not undertaken.

Table 3: Post-mining land uses

Project area	Pre-mining land use	Post-mining land use (PMLUP)	Post-mining land use (PRCP)
Infrastructure areas			
Office area	Grazing/native ecosystem	Grazing/native ecosystem	Low intensity grazing
Diversion bunds	Grazing/native ecosystem	Grazing/native ecosystem	Low intensity grazing
Haul road	Grazing/native ecosystem	Grazing/native ecosystem	Low intensity grazing
Stormwater management features	Grazing/native ecosystem	Grazing/native ecosystem	Low intensity grazing
Waste			
WRD	Grazing/native ecosystem	Grazing/native ecosystem	Low intensity grazing
Run-of-Mine (ROM)			
ROM pad	Grazing/native ecosystem	Grazing/native ecosystem	Low intensity grazing
Voids			
Final void	Grazing/native ecosystem	Non-use management area	Low intensity grazing
Dams			
Sediment Dam	Grazing/native ecosystem	Grazing/native ecosystem	Low intensity grazing

Project area	Pre-mining land use	Post-mining land use (PMLUP)	Post-mining land use (PRCP)
Dingo Dam ¹	Water Storage	Water storage	Water storage

1. Dingo Dam is a pre-existing structure owned by the landowner.

3.3 Site-specific rehabilitation objectives

Site-specific rehabilitation objectives have been developed for the Project and are described in the Rehabilitation Monitoring Program (2020). These rehabilitation objectives have been developed based on the information identified in desktop reviews and field surveys.

The following rehabilitation objectives are relevant:

- adequate vegetation cover to minimise erosion; and
- self-sustaining vegetation cover and species similar to adjoining undisturbed areas.

Rehabilitation indicators provide measures of progress towards rehabilitation objectives. Completion criteria are the standards that provide a clear definition of successful rehabilitation. Completion criteria take the form of a set of measurable benchmarks against which the rehabilitation indicators can be compared to determine whether objectives are being met. Rehabilitation is deemed successful when completion criteria for each rehabilitation goal and objective are consistently met.

Table 4 details the rehabilitation objectives, indicators, and completion criteria relevant to achieving the prescribed PMLU. It is noted these criteria were applicable at the time of monitoring, with the recent submission of the transitional PRCP future rehabilitation monitoring events will be assessed against the nominated completion criteria set out in the PRCP.

Table 4: Applicable rehabilitation goals, objectives, indicators, and completion criteria

Mining lease	PMLU	Rehabilitation goal	Rehabilitation objective	Completion criteria
Infrastructure (ML10324)				
Office area	Low intensity grazing	Long-term safety	Site is safe for humans and animals now and in the foreseeable future.	Vegetation cover to meet the completion criteria set in Table 5 below.
		Stable	Vegetation cover to minimise erosion.	
		Sustainable land use	Soil properties that support and will continue to support desired land use.	
			Establish specified self-sustaining natural vegetation or habitat.	
			Establish land use with comparable management requirements to adjacent non-mined land.	
Diversion bunds	Low intensity grazing	Long-term safety	Site is safe for humans and animals now and in the foreseeable future.	
		Stable	Vegetation cover to minimise erosion.	
			Landform design achieves appropriate erosion rates	
		Sustainable land use	Soil properties that support and will continue to support desired land use.	
			Establish specified self-sustaining natural vegetation or habitat.	
			Establish land use with comparable management requirements to adjacent non-mined land.	
Haul road	Low intensity grazing	Long-term safety	Site is safe for humans and animals now and in the foreseeable future.	
		Stable	Vegetation cover to minimise erosion.	

Mining lease	PMLU	Rehabilitation goal	Rehabilitation objective	Completion criteria
		Sustainable land use	Soil properties that support and will continue to support desired land use.	
			Establish specified self-sustaining natural vegetation or habitat.	
			Establish land use with comparable management requirements to adjacent non-mined land.	
Run-of-mine (ROM) (ML10324)				
ROM pad	Low intensity grazing	Long-term safety	Site is safe for humans and animals now and in the foreseeable future.	Vegetation cover to meet the completion criteria set in Table 5 below.
		Stable	Vegetation cover to minimise erosion.	
		Sustainable land use	Soil properties that support and will continue to support desired land use.	
			Establish specified self-sustaining natural vegetation or habitat.	
			Establish land use with comparable management requirements to adjacent non-mined land.	
Waste (ML10324)				
Waste rock dump	Low intensity grazing	Long-term safety	Site is safe for humans and animals now and in the foreseeable future.	Post closure monitoring shows the final landform is compliant with established and applicable limits.
		Stable	Vegetation cover to minimise erosion.	Vegetation cover to meet the completion criteria set in Table 5 below.
		Sustainable land use	Soil properties that support and will continue to support desired land use.	
			Establish specified self-sustaining natural vegetation or habitat.	

Mining lease	PMLU	Rehabilitation goal	Rehabilitation objective	Completion criteria
			Establish land use with comparable management requirements to adjacent non-mined land.	
Void (ML10324)				
Dingo Dam pit	NUMA	Stable	Landform design achieves appropriate erosion rates.	Assessment and certification of analytical results (through the Rehabilitation Monitoring Program) within applicable guideline values (water, sediment and soils).
Water management (ML10324)				
Sediment Dam	Low intensity grazing	Long-term safety	Site is safe for humans and animals now and in the foreseeable future.	Assessment and certification of analytical results (through the Rehabilitation Monitoring Program) within applicable guideline values (water, sediment and soils).
		Stable	Landform design achieves appropriate erosion rates.	
Stormwater management structures	Low intensity grazing	Long-term safety	Site is safe for humans and animals now and in the foreseeable future.	Vegetation cover to meet the completion criteria set in Table 5 below.
		Stable	Vegetation cover to minimise erosion	
		Sustainable land use	Soil properties that support and will continue to support desired land use.	
			Establish specified self-sustaining natural vegetation or habitat.	
			Establish land use with comparable management requirements to adjacent non-mined land.	
Exploration (ML 10322)				
Exploration areas	Low intensity grazing	Stable	Vegetation cover to minimise erosion.	Post closure monitoring shows the final landform is compliant with established and applicable limits.
		Sustainable land use	Soil properties that support and will continue to support desired land use.	

Mining lease	PMLU	Rehabilitation goal	Rehabilitation objective	Completion criteria
			Establish specified self-sustaining natural vegetation or habitat.	Vegetation cover to meet the completion criteria set in Table 5 below.
			Establish land use with comparable management requirements to adjacent non-mined land.	

Table 5: *Revegetation and landform completion criteria*

Parameter	Revegetation completion criteria
Vegetation density/percentage of ground cover	Ground cover to be not less than 80% of the average percentage ground cover of analogue sites.
Diversity of species	Equal to or greater than 60% of the comparable species diversity of analogue sites.
Abundance of weeds	Weeds not to exceed 10% more than average percentage cover of analogue sites.
Landforms	No active rill erosion deeper than 30 cm.
Landform design	WRD batter slopes are <36° to the angle of repose.

4 Previous monitoring

4.1 Rainfall and seasonal influences

Seasonal rainfall influences vegetation growth and thus the results of rehabilitation monitoring and should be considered when comparing rehabilitation monitoring data over time. The wet season typically occurs from November to April, with approximately 81% of mean annual rainfall occurring during these months.

Rainfall data can be obtained from the Queensland Government's SILO (Scientific Information for Land Owners) climate database, which uses observational data as well as mathematical interpolation techniques to infill gaps in time series. Climate data for the region was obtained from the SILO grid point nearest the mine (-19.20, 145.70) and the nearest weather station which is located approximately 20 km south-east of the Project, at Hillgrove Station (#30137).

4.2 Historic monitoring results

Field-based assessments of rehabilitation progress have previously been undertaken in September 2018, to provide a broad assessment of final landform stability and the success of past rehabilitation activities. Monitoring at that time included surface water, stream sediment, topsoil quality sampling and analysis and visual assessment of vegetation establishment and erosion.

For the most part, rehabilitated landforms were found to be stable with minor and moderate areas of erosion occurring infrequently on the slopes of the WRD and final void. Rehabilitation success in terms of vegetation cover was limited across the Project site with the western portion of the WRD supporting the most prominent area of established groundcover vegetation. Groundcover species identified in rehabilitation areas included *Heteropogon contortus*, *Melinis repens*, *Aristida spp.*, *Chloris gayana*, *Stylosanthes scabra*, *Urochloa mosambicensis* and *Sclerolaena spp.* A small number of pioneering Acacia shrubs were scattered across the rehabilitation areas.

Soils were sampled from representative sites within each rehabilitation domain and samples analysed to identify soil characteristics in rehabilitation areas. Soil quality results from rehabilitation areas were compared to results obtained from representative reference sites as well as relevant guideline values.

A summary of the findings is detailed below:

- Final landforms were found to be stable with minor and moderate areas of erosion occurring infrequently on the slopes of the WRD and pit.
- Successful rehabilitation with regards to vegetation cover was limited across the Project site with the western portion of the WRD supporting the most prominent area of established groundcover vegetation.
- Topsoils at analogue sites returned more favourable analysis results for vegetation growth than impact sites.

5 Methodology

5.1 Rehabilitation monitoring program design

The RMP is designed to assess rehabilitation progress to effect acceptance of rehabilitation by the administering authority and to support surrender of the MLs. A key assessment will be the behaviour of rehabilitated areas in comparison with surrounding non-mined lands.

To allow a comparative assessment to occur, monitoring will be carried out across both rehabilitated areas as well as adjacent non-mined lands considered representative of local soils, ecology and land use.

Rehabilitation monitoring activities have been adapted to address the variation in disturbance activities that occurred on ML10324 and ML10332.

Permanent analogue sites have been established at locations that have not been impacted by past mining activities to be representative of the rehabilitation objectives defined for the Project and corresponding land uses. Monitoring sites were established at locations representative of the different rehabilitation areas throughout the Project.

5.2 Monitoring sites

Rehabilitation sampling density was determined with consideration to the total disturbance area within a particular domain or rehabilitation area (e.g., total area occupied by all dams belonging to the water storage domain) and confirmed by experienced ecologists during the initial RMP.

A total of four analogue sites and 12 rehabilitation monitoring sites have been established across Dingo Dam ML (ML10324). Three analogue sites and three rehabilitation monitoring sites have been established on the Lucky Break (ML10332). The rehabilitation locations are described in Table 6.

Table 6: Rehabilitation monitoring locations

Mine disturbance area	Site reference name	Description
Dingo Dam (ML10324)		
Analogue site	REF 1	RE 9.3.22 <i>Eucalyptus crebra</i> woodland
	REF 2	RE 9.3.22 <i>Eucalyptus crebra</i> woodland.
	REF 3	RE 9.3.22 / 9.5.11 <i>Eucalyptus crebra</i> woodland (2006 survey) / RE 9.3.22 <i>Eucalyptus crebra</i> woodland (remnant vegetation mapping 2023).
	REF 4	RE 9.3.22 / 9.5.11 <i>Eucalyptus crebra</i> woodland (2006 survey) / RE 9.3.22 <i>Eucalyptus crebra</i> woodland (remnant vegetation mapping 2023).
Waste rock dump (WRD)	WRD 1	Located on the northern slope facing the ROM pad.
	WRD 2	Located on the south-western face of the WRD, facing the pit void.
	WRD 3	Located on the top of the WRD.
ROM	ROM 1	Located in the north of the ROM.
	ROM 2	Located in south-eastern corner of the ROM.
Office	OFFICE 1	North-west to south-eastern orientation.
	OFFICE 2	North-east to south-west orientation.
Sediment Dam	SED DAM 1	Located in the northern area of the Sediment Dam.
	SED DAM 2	Located in the southern area of the Sediment Dam.
Final void	VOID 1	Located on the pit void slope, below the current sampling location WRD 1.
	VOID 2	Located below Dingo Dam, on the north-west aspect slope of the pit void
	VOID 3	Located on the pit void slope on the northern most region of the void.
Lucky Break (ML10332)		
Analogue site	NORTH REF 1	RE 9.3.22 <i>Eucalyptus crebra</i> woodland.
	NORTH REF 2	RE 9.3.22 <i>Eucalyptus crebra</i> woodland.
Exploration disturbance	DRILL 1	Located in the area having a high concentration of drillholes.
	DRILL 2	Located in the area having a high concentration of drillholes.

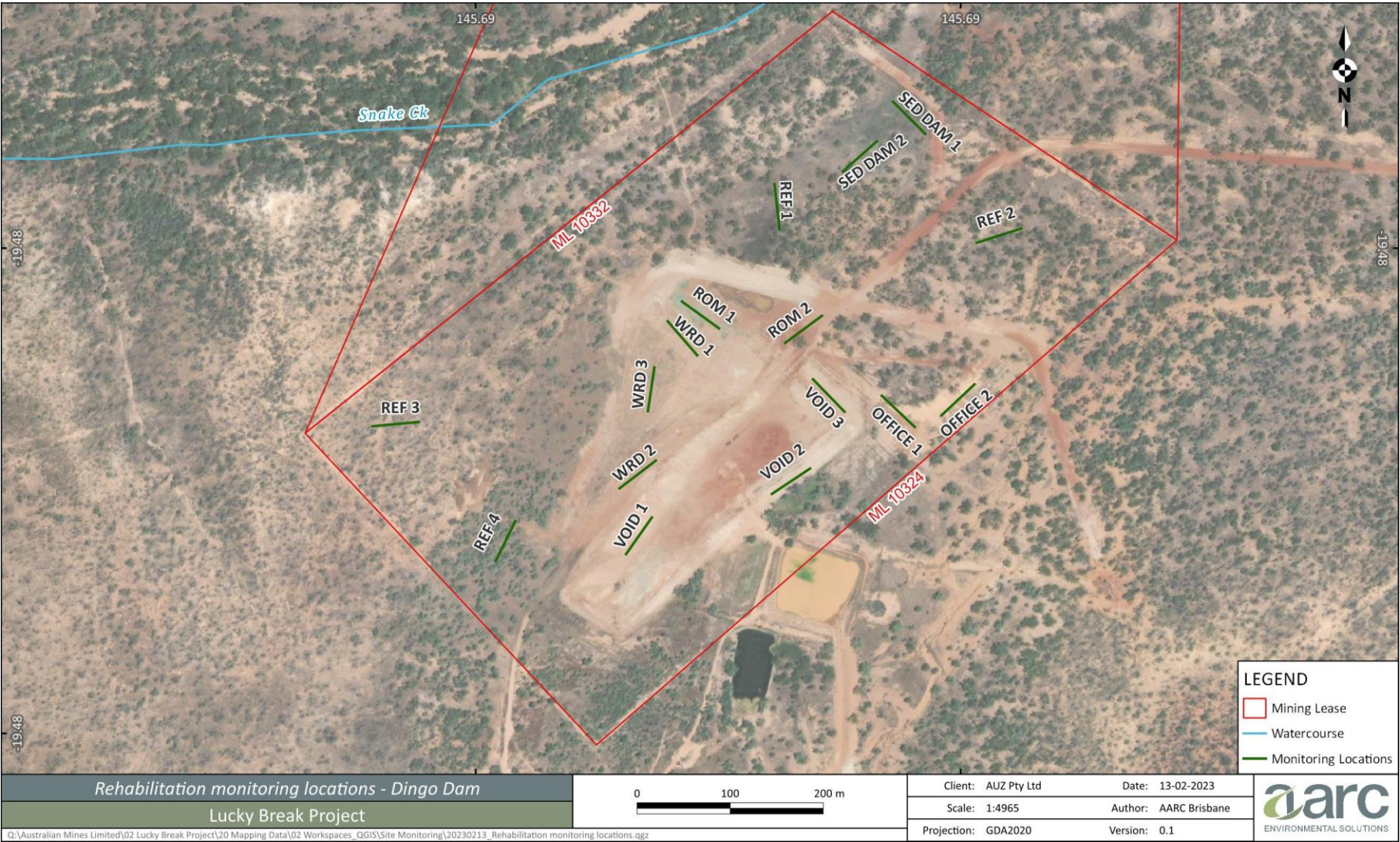


Figure 3: Dingo Dam rehabilitation monitoring locations

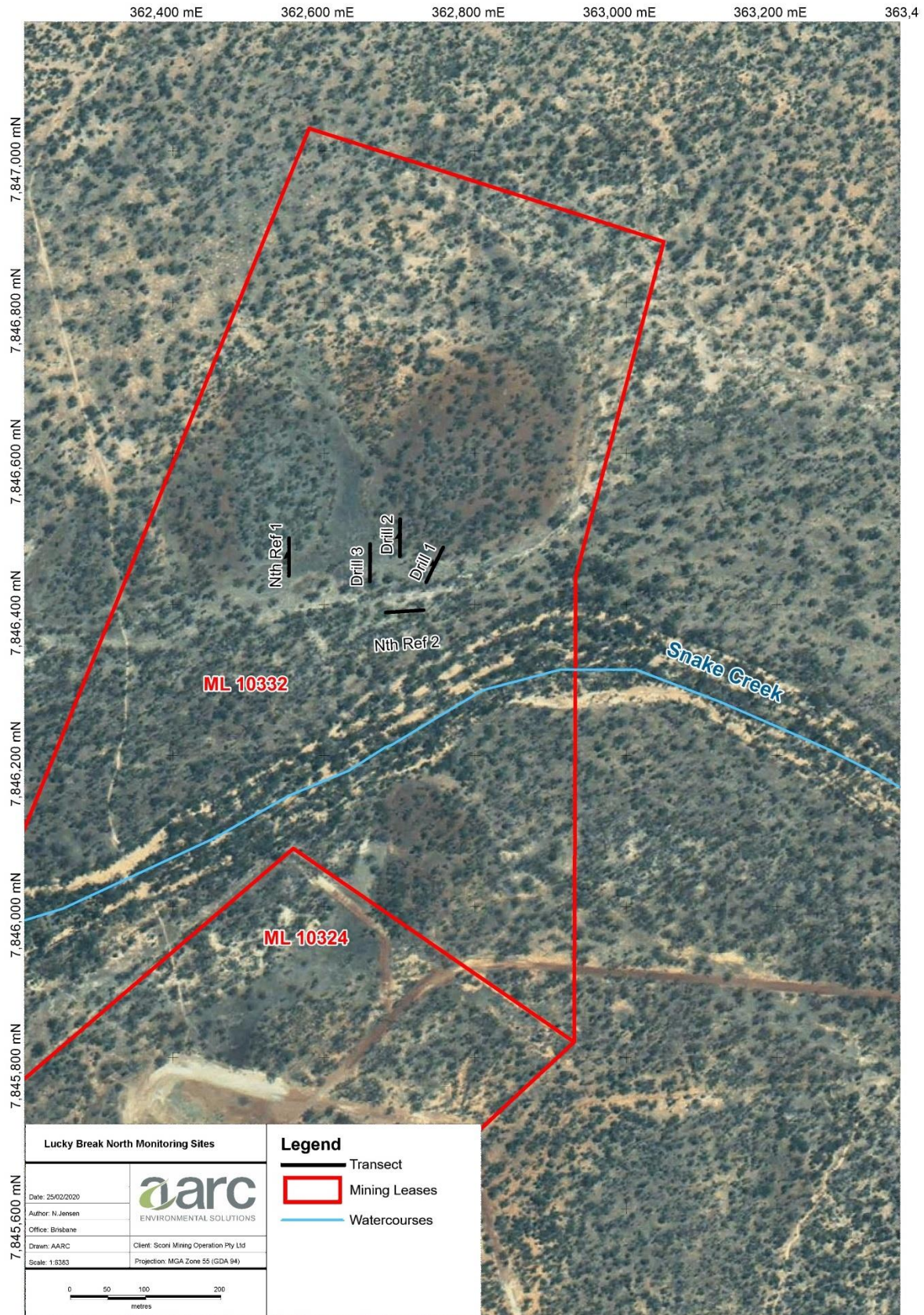


Figure 4: Lucky Break ML rehabilitation monitoring locations

5.3 Monitoring methodology

5.3.1 Dingo Dam (ML10324)

5.3.1.1 Vegetation monitoring

Vegetation monitoring involves the collection of quantitative data on ground cover composition, species richness, woody stem density, canopy cover and recruitment. At each monitoring site, a 50 m tape was run out to establish a transect, and a star picket installed at each end of each transect to identify consistently and precisely the permanent transect location. The transect area extends 5 m on either side of the 50 m tape, giving a total plot area of 50 m x 10m for each monitoring site.

The survey methodologies outlined below have been adapted from the Queensland Herbarium survey technique *Methodology for Surveying and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Version 6.0) (Neldner *et al.* 2022) and the *Method for the Establishment and Survey of Reference Sites for BioCondition* (Version 3) (Eyre *et al.* 2017), and its companion manual *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland* (Version 2.2) (Eyre *et al.* 2015).

Ground cover

This method involves the collection of quantitative data on the average ground cover where the percentage of all types of ground cover within ten 1 m x 1 m quadrats is determined. A quadrat is placed every 5 m on alternating sides along the 50 m transect, commencing at 0 m on the left and the final quadrat at 45 m (see Figure 5). In each quadrat, the total percentage of ground cover of each plant species in the quadrat is recorded, as well as the percentage cover of bare soil, rock, and organic litter. Species are classified into growth forms (vine, aerial, grass, forb, fern, shrub, tree) for reporting purposes.

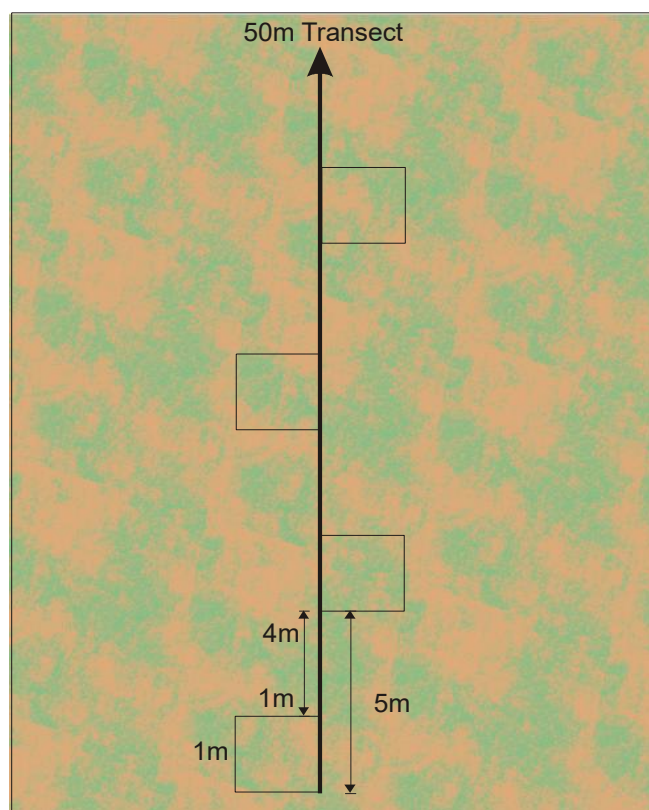


Figure 5: Ground cover percentage sampling

Species richness

Species richness is assessed using the method outlined in Eyre *et al.* (2017) where all vascular plants occurring within a 10 m x 50 m plot area are recorded. A surveyor walks along each side of the 50 m transect centreline and records all trees, shrubs, forbs/other species and grasses occurring within 5 m of either side of the centreline.

Species that are not able to be identified in the field are collected for later identification or are sent to the Queensland Herbarium for identification.

Woody stem density

Woody stem density is calculated using a methodology adapted from *the Method for the Establishment and Survey of Reference Sites for BioCondition* (Eyre *et al.* 2017). All woody stems for each tree and shrub species are counted within the 10 m x 50 m plot area (i.e. 5 m on both sides of each 50 m transect). From this data, both total woody stem density, as well as the density of each tree or shrub species are calculated. The density of species and growth forms on the monitoring sites is then calculated using the following equation:

$$\text{Density per hectare (ha)} = \text{Number of stems recorded within the transect} \times 20.$$

Canopy cover

Tree canopy cover can be used to characterise stand productivity and the distribution and abundance of biomass (Eyre *et al.* 2017). It refers to the estimation of the percentage canopy cover of the living, native tree layer along a 50 m transect, using the line intercept method (Greig-Smith *et al.* 1964). For this attribute, the vertical projection of the tree canopy cover of the species making up the tree canopy cover is assessed. The vertical projection of the tree canopy over the 50 m transect is recorded as illustrated in Figure 6. The total length of the projected canopy of each layer is then divided by the total length of the tape to give an estimate of percentage canopy cover on the site.

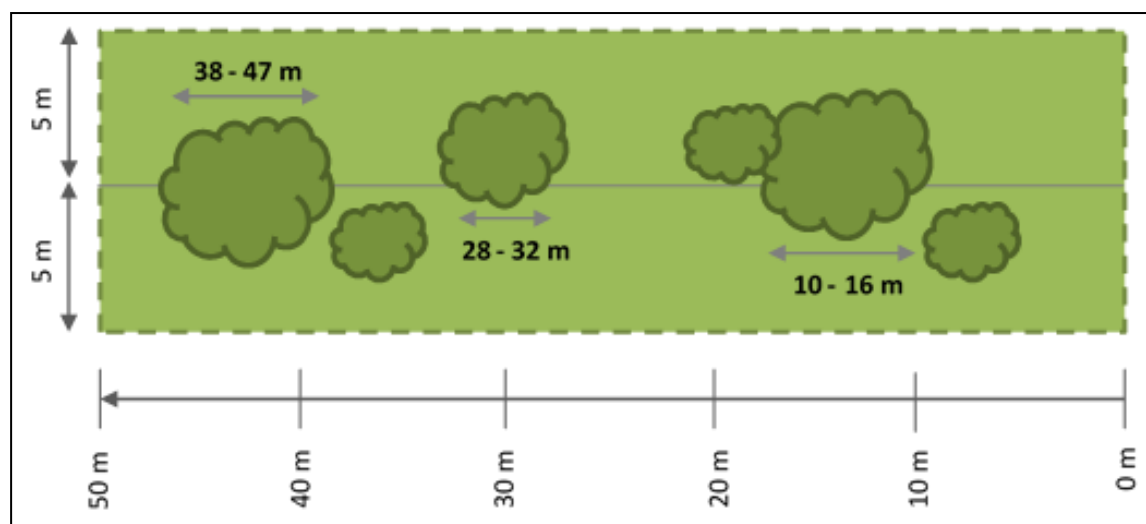


Figure 6: Guide to monitoring canopy cover (Eyre *et al.* 2017)

Recruitment

Recruitment is assessed using a methodology adapted from *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland*. (Eyre *et al.* 2015), whereby recruitment is assessed over the 10 m x 50 m plot area (5 m on both sides of each 50 m transect) (refer to Figure 6). Within this plot, the proportion of dominant species found to be regenerating are counted. A recruit is identified as a woody stem species with a

diameter at breast height of <5 cm. For each dominant canopy species present, at least one individual satisfying these criteria must be present for the species to be considered as recruiting. The presence of a recruit from all dominant canopy species would result in 100% recruitment.

5.3.1.2 Photographic monitoring

Photographic monitoring provides a visual record of the vegetation, ground cover, erosion and general appearance of each analogue and rehabilitation site, allowing these sites to be compared over time (Eyre *et al.* 2015). A digital camera is used to take the photos so that a permanent record can be kept for each site. The process of taking the monitoring photos is as follows:

- The person taking the photograph stands at the star picket which marks the beginning of the 50 m transect within each of the sites;
- The camera is then aimed directly towards the end of the 50 m transect and a single photograph is taken;
- The photographer then stands at the star picket at the opposite end of the 50 m transect;
- The camera is then aimed directly towards the start of the 50 m transect and a single photograph is taken; and
- The digital photographs are then downloaded and stored for future reference.

5.3.1.3 Erosion monitoring

Erosion at survey sites is monitored through visual assessment. Assessment is undertaken by traversing the 50 m transects and recording the number and average depth of any erosion features, rill lines or gullies. It should be noted that the placement of permanent transects may not be representative of the level of erosion across the entire rehabilitated landform. To compensate for this, general observations undertaken during the survey are also utilised in assessing rehabilitation performance.

Table 7 outlines how erosion observed on-site is classified. The overall classification of the erosion on each transect is determined by the highest classification attributed to either the number of rills/gullies or the average depth. For example, a transect may present only one or two rills but if these are recorded as being 25 cm deep, the transect will be classified as presenting a Moderate erosion classification.

Table 7: Erosion classification

Erosion classification	Minor	Moderate	Severe	Extreme
Number of rills/ gully(s)*	<15	15 - 30	31 - 50	>50
Average depth (cm)	<10	10 - 30	30 - 60	>60
Proportion of site affected by disturbance (%)	<1	1-5	>5	-

1. Gully: Highly visible form of soil erosion, with steep-sided, incised, drainage lines greater than 30 cm deep.

2. after Neldner *et al.* 2019.

It should be noted that the placement of the permanent transects may not be representative of the level of erosion across the entire rehabilitation area landforms. To compensate for this, general observations undertaken during the survey are also utilised in assessing rehabilitation performance. The location of any severe erosion outside the transect (i.e. tunnels, mass wasting, large gullies) is also recorded and marked with a handheld GPS.

The following information is recorded at each site:

- GPS reading of location;
- general description of type of erosion (gully [>30 cm], rill line [<30 cm]) and possible causes;
- depth of erosion;
- width of erosion;
- length of erosion;
- where eroded material is being deposited; and
- whether the erosion line is stabilised by vegetation.

5.3.1.4 Satellite-derived fractional vegetation cover

To align with contemporary rehabilitation monitoring methods and provide further evidence of rehabilitation success and land stability, fractional vegetation cover (FVC) surveys have been undertaken.

FVC is defined as that fraction of a satellite imagery pixel representing ground condition across three ground cover classes being:

- 1) photosynthetic vegetation;
- 1) non-photosynthetic vegetation; and
- 2) bare ground.

A median value of FVC can be determined for all satellite imagery pixels within a defined polygon area (or set of combined polygons). Subject to certain limitations, a median FVC value can be determined for polygons enclosing a rehabilitation area which are then able to be compared with polygons enclosing a reference/analogue area that is representative of unmined land having similar landform, land cover and land use.

Satellite-derived indices will be reported annually based on one imagery acquisition per calendar month (12 per annum). Except where cloud cover or cloud shadow occlude the study area in a calendar month, imagery of the study area and acquisition metadata are assessed.

FVC is reported in graphical form with median and interquartile ranges for each rehabilitation polygon and combined reference area polygons. In addition, dates and duration of failure to achieve the target are reported in tabular form with mapping information for sources of non-compliance.

Source data:

Satellite imagery from the Sentinel 2 global earth observation mission acquires imagery on a 5–12-day interval at wavelengths between 400–2,500 nm. Reflectance indices based on the spectral reflectance profiles of photosynthetic vegetation, non-photosynthetic vegetation and bare ground is calculated and directly correlated with field-collected data to calculate FVC for each rehabilitation and reference polygon. Field calibration and validation are required to be re-established if a significant disturbance occurs (e.g., fire/drought).

Calibration and validation:

Calibration and validation of FVC is to be conducted during annual fixed transect monitoring using either (a) point intercept transects per Muir *et al.* (2011) modified to 50 m or (b) sub-10 cm UAV imagery captured as 1 ha blocks ISODATA clustering and supervised spectral class assignment provide FVC where UAV imagery is available.

5.3.1.5 Soil monitoring

Soil monitoring involves the collection of topsoil samples from a maximum depth of 10 cm to obtain quantitative data on the chemical and physical properties of soil. Soil sampling methodology has been adapted from *Monitoring and Sampling Manual Environmental Protection (Water) Policy 2009* (DES 2018). Soil sampling is conducted by collecting approximately 200 g samples with a clean non-metallic shovel and bucket every 10 m along the 50 m transect. The first sample is collected at 0 m. These five samples are mixed in the bucket. The final 200 g soil sample is taken from the mix and placed into plastic sample bag. Samples are sent to a National Association of Testing Authorities (NATA) certified laboratory for analysis of indicators of soil nutrition and land contamination including:

- pH;
- electrical conductivity (EC);
- soluble chloride;
- moisture content;
- Emerson aggregate stability test;
- exchange acidity;
- exchangeable cations (calcium, magnesium, potassium, sodium and aluminium);
- cation exchange capacity;
- calcium: magnesium ratio (Ca: Mg);
- exchangeable sodium percentage (ESP);
- total nitrogen, nitrite and nitrate;
- sulphate;
- extractable potassium and phosphorous (Colwell);
- total organic carbon and organic matter; and
- trace elements (arsenic, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel and zinc).

Soil moisture content shall be measured for interpretive purposes only and will not be assessed in determining rehabilitation performance.

5.3.2 Lucky Break (ML10332)

Disturbance on the Lucky Break ML has been limited to historic exploration activities in 2004 and 2005. Areas disturbed by exploration activities have been rehabilitated and show good vegetation cover. Given the limited disturbance and time lapsed since exploration activities occurred, photographic monitoring as described in section 5.3.1.2 will be used to demonstrate success against the completion criteria.

6 Results and interpretation

Results from the field survey undertaken in 2022 have been assessed against the completion criteria (Table 5) to assess the progress of rehabilitation and its success. It is noted that when analysing the results, the target PMLU is a grazing landscape, as such the number and diversity of trees has not been used as a measure of successful rehabilitation.

6.1 Ground cover

The mean groundcover of the key functional groups recorded during the 2022 surveys is summarised in Table 8 and Table 9. The relevant completion criteria calculated from the 80th percentile of reference results for ground cover have also been included.

Weed cover at all locations meets the completion criteria of 'weeds not to exceed 10% more than average percentage cover of analogue sites'.

Total live cover (excluding weeds) ranged between 24.3% at the Void, to 93.9% at the ROM pad. Total live cover was reported to be above the 60th percentile of reference sites at all rehabilitation monitoring domains, excluding the Void.

Total ground cover was also measured at all monitoring locations. Total ground cover encompasses photosynthetic, non-photosynthetic vegetation and rocks which, in combination, help provide structural integrity to the final landform by minimising erosion (Australian Government & National Landcare Program n.d). Maintaining high levels of groundcover also assists in water absorption, promotes plant growth and provides habitat for ground dwelling fauna. Total average groundcover at reference locations was reported to be 89.4%, with 68.7% ground cover at the 80th percentile (completion criteria). All rehabilitation sites reported total ground cover above the 60th percentile of 53.6%, with average total ground cover the highest at the ROM pad domain reporting 93.9% total ground cover. Average ground cover at the WRD (64.1%), Sediment Dam (60.3%) and the Void (59.8%) fall below the 80th percentile completion criteria.

Monitoring at rehabilitation and reference locations demonstrates that the landscape within the Dingo Dam ML is dominated by pasture grasses. Pasture grasses (native and exotic) comprise 43.3% of ground cover at reference locations, with a minimum of 34.7% pasture groundcover required for rehabilitation sites to demonstrate achievement of the completion criteria. Rehabilitation sites reported total pasture cover ranging between 19.8% at the Void and 72.6% at the ROM pad. Target criteria was achieved at all locations, except for the Void and Sediment Dam. Photographs taken at the Void and Sediment Dam in 2022 indicate that vegetation cover is variable, and that the locations of many of the monitoring transects are now, coincidentally, located at areas of reduced groundcover (Figure 7).

The percentage of shrubs and forbs recorded at reference sites was also compared against that recorded for rehabilitation monitoring locations. An average of 15.6% forbs and other non-grass species were reported at reference sites. A higher percentage of forbs and other non-grasses were reported at the Void, Sediment Dam and ROM pad when compared to reference sites. However, less than the 60th percentile of reference sites of forbs and other non-grasses was reported at the WRD and Office domains.

Stinking passionflower (*Passiflora foetida*), an environmental weed was recorded at both a reference site (REF 1) and at the ROM monitoring locations. The Stinking passionflower is a climbing or scrambling vine with sticky hairs over most of the plant. The fruit of the Stinking passionflower is edible; however, the leaves contain cyanic acid which is thought to be poisonous to people and livestock.

6.2 Species richness

The species richness across the different vegetation structural communities (grasses, forbs and weeds) was comparable and within 60% across reference and rehabilitation sites for the 2022 monitoring event. Reference locations reported a higher diversity of shrubs and trees, however, this is expected as revegetation of rehabilitation locations have targeted grazing pasture and ground cover for structural cover of the landform.

Most rehabilitation sites (with the exception of the Void) reported at least three (3) species of grasses and shrubs. The native grass, Blackheaded Speargrass was recorded at most locations. The following species compatible with a grazing landscape were found at all domains and reference locations:

- Red Natal;
- Rhodes Grass;
- Shrubby Stylo;
- Pin Sida; and
- Sally Wattle.

6.3 Restricted invasive plants

No restricted invasive plants under the *Biosecurity Act 2014* were recorded in either the reference locations or rehabilitation monitoring locations.

Table 8: Average ground cover at reference locations and completion criteria

Parameter	Native pasture grasses	Exotic pasture grasses	Shrubs and trees	Forbs and other non-grass species	Weeds	Total live cover (excluding weeds)	Total ground cover	Total pasture grasses
Reference sites	8.5%	34.8%	6%	15.6%	0.1%	65%	89.4%	43.3%
Completion criteria (80%)	NA			12.4%	0.2%	52%	68.7%	34.7%

Table 9: Average ground cover at rehabilitation monitoring locations by mine domain

Mine domain	Native pasture grasses	Exotic pasture grasses	Shrubs and trees	Forbs and other non-grass species	Weeds	Total live cover (excluding weeds)	Total ground cover (excluding weeds)	Total pasture grasses
Waste rock dump	3.1%	30.9%	0.5%	8.2%	0%	42.7%	64.1%	43.4%
ROM pad	1.5%	71.1%	0.3%	19.5%	0%	92.4%	93.9%	72.6%
Office	10.5%	53.4%	0.5%	8.3%	0%	72.7%	81.6%	63.9%
Sediment Dam	14.8%	9.0%	2.0%	17.9%	0%	43.7%	60.3%	23.8%
Void	33.2%	3.2%	4.1%	16.6%	0%	24.3%	59.8%	19.8%
All monitoring sites	6%	34.1%	0.7%	10.7%	0%	51.5%	70.3%	40.2%

Note: green cells indicate that the completion criteria have been achieved, red cells indicate that sites do not meet 80th percentile of reference sites. Completion criteria for ground cover does not apply to uncoloured cells.



Figure 7: Void monitoring locations 2022

Table 10: Average species richness by mine domain

Mine domain	Native pasture grasses	Exotic pasture grasses	Forbs and other non-grass species	Shrubs and trees	Weeds	Total species richness (excluding weeds)	Total pasture grasses
Reference	1.8	1.8	5.8	5.3	0.5	5.8	1.8
60% reference values	1.1	1.1	3.5	3.2	0.3	3.5	1.1
Waste rock dump	0.7	2.3	6	2.3	0	2.3	3.0
ROM pad	1.5	2.5	4.5	1.5	1	2.5	3.0
Office	1.5	2.5	4.0	1.0	0	1.5	4.0
Sediment Dam	2.0	1.0	5.0	3.0	0	3.0	3.0
Void	0.7	1.7	5.0	3.3	0	3.3	2.3
All monitoring sites	1.1	1.9	5.3	2.4	1	2.6	3.0

Note: green cells indicate that the completion criteria have been achieved, red cells indicate that sites do not meet 60th percentile of reference sites. Completion criteria for species richness does not apply to uncoloured cells.

Table 11: Species recorded by domain

Domain	Native pasture grasses	Exotic pasture grasses	Forbs and other non-grass species	Shrubs and trees	Weeds
Reference sites	<i>Heteropogon contortus</i> (Blackheaded Speargrass) <i>Panicum decompositum</i> (Native Millet) <i>Eragrostis elongata</i> <i>Themeda triandra</i> (Kangaroo Grass)	<i>Melinis repens</i> (Red Natal) <i>Cenchrus ciliaris</i> (Buffel Grass) <i>Chloris gayana</i> (Rhodes Grass)	<i>Stylosanthes scabra</i> (Shrubby Stylo) <i>Sida fibulifera</i> (Pin Sida) <i>Achyranthes aspera</i> (Chaff Flower) <i>Malvastrum americanum</i> (Spiked Malvastrum) <i>Phylanthus maderspatensis</i> (Spurge) <i>Evolvulus alsinoides</i> (Tropical Speedwell) <i>Mimosa pudica</i> (Sensitive Plant) <i>Rhynchosia minima</i> (Rhyncho) <i>Trichodesma zeylanicum</i> (Camel Bush) <i>Acanthaceae sp.</i> <i>Sida rhombifolia</i> (Arrowleaf Sida) <i>Ipomoea plebian</i> (Bell Vine) <i>Corchorus sidoides</i> (Flannel Jute)	<i>Acacia salicina</i> (Sally Wattle) <i>Melaleuca nervosa</i> (Fibrebark) <i>Tephrosia leptoclada</i> (Slender Tephrosia) <i>Corymbia erythrophloia</i> (Red Bloodwood) <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark) <i>Alphitonia excelsa</i> (Soap Bush) <i>Grewia latifolia</i> (Dogs Balls) <i>Rustaceae sp.</i> <i>Flueggea leucopyrus</i> <i>Eucalyptus mediocris</i> (White Mahony) <i>Breynia oblongifolia</i> (Coffee Bush) <i>Pittosporum spinescens</i> (Wallaby Apple) <i>Atalaya hemiglauca</i> (Whitewood) <i>Unidentified Eucalyptus</i> <i>Alphitonia excelsa</i> (Red Ash) <i>Grevillea parallela</i> (Silver Oak) - Unidentified shrub 1 - Unidentified shrub 2	<i>Passiflora foetidia</i> (Stinking Passionflower) <i>Vachellia parnesiana</i> (Mimosa Bush)
Waste rock dump	<i>Sporobolis australasicus</i> (Australian Dropseed) <i>Heteropogon contortus</i> (Blackheaded Speargrass)	<i>Melinis repens</i> (Red Natal) <i>Chloris gayana</i> (Rhodes Grass) <i>Glycine tabacina</i> (Sabi Grass)	<i>Desmodium trichostachyum</i> <i>Stylosanthes scabra</i> (Shrubby Stylo) <i>Glycine tabacina</i> (Variable Glycine) <i>Rhynchosia minima</i> (Rhyncho) <i>Achyranthes aspera</i> (Chaff Flower) <i>Portulaca oleracea</i> (Black Pigweed) <i>Sida fibulifera</i> (Pin Sida) <i>Macroptilium atropurpureum</i> (Siratro) <i>Tephrosia leptoclada</i> (Slender Tephrosia) <i>Stylosanthes hamata</i> (Caribbean Stylo) <i>Phylanthus maderspatensis</i> (Spurge) <i>Malvastrum americanum</i> (Spiked Malvastrum)	<i>Acacia holosericea</i> (Silver Wattle) <i>Salsola australis</i> (Roly Poly) <i>Acacia leptocarpa</i> (North Coast Wattle) <i>Acacia salicina</i> (Sally Wattle) <i>Trema tomentosa</i> (Poison Peach)	None recorded
ROM pad	<i>Heteropogon contortus</i> (Blackheaded Speargrass)	<i>Chloris gayana</i> (Rhodes Grass) <i>Melinis repens</i> (Red Natal)	<i>Glycine tabacina</i> (Variable Glycine) <i>Stylosanthes scabra</i> (Shrubby Stylo) <i>Stylosanthes hamata</i> (Caribbean Stylo) <i>Sida fibulifera</i> (Pin Sida) <i>Achyranthes aspera</i> (Chaff Flower) <i>Malvastrum americanum</i> (Spiked Malvastrum) <i>Rhynchosia minima</i> (Rhyncho) <i>Sida rhombifolia</i> (Arrowleaf Sida) <i>Mimosa pudica</i> (Sensitive Plant) <i>Macroptilium atropurpureum</i> (Siratro)	<i>Acacia salicina</i> (Sally Wattle) <i>Acacia holosericea</i> (Silver Wattle)	<i>Passiflora foetidia</i> (Stinking Passionflower)
Office	<i>Sporobolus diandrus</i> (Tussocky Sporobolus) <i>Heteropogon contortus</i> (Blackheaded Speargrass)	<i>Melinis repens</i> (Red Natal) <i>Megathyrsus maximus</i> (Green Panic) <i>Chloris gayana</i> (Rhodes Grass)	<i>Achyranthes aspera</i> (Chaff Flower) <i>Stylosanthes scabra</i> (Shrubby Stylo) <i>Sida fibulifera</i> (Pin Sida) <i>Aeschynomene indica</i> (Indian Joint Vetch)	<i>Acacia salicina</i> (Sally Wattle) <i>Salsola australis</i> (Roly Poly)	None recorded

Domain	Native pasture grasses	Exotic pasture grasses	Forbs and other non-grass species	Shrubs and trees	Weeds
			<i>Malvastrum americanum</i> (Spiked Malvastrum)		
Sediment Dam	<i>Eragrostis lacunaria</i> (Purple Love Grass) <i>Themeda triandra</i> (Kangaroo Grass) <i>Echinochloa colona</i> (Awnless Barnyard)	<i>Melinis repens</i> (Red Natal) <i>Megathyrsus maximus</i> (Green Panic)	<i>Macroptilium atropurpureum</i> (Siratro) <i>Malvastrum americanum</i> (Spiked Malvastrum) <i>Ludwigia perennis</i> (Upright Primrose) <i>Sida fibulifera</i> (Pin Sida) <i>Stylosanthes scabra</i> (Shrubby Stylo) <i>Marsilea drummondii</i> (Nardoo) <i>Cyperus iria</i> (Rice Flat Sedge) <i>Aeschynomene indica</i> (Indian Joint Vetch) <i>Mimosa pudica</i> (Sensitive Plant)	<i>Eucalyptus mediocris</i> (White Mahony) <i>Grewia latifolia</i> (Dogs Balls) <i>Acacia holosericea</i> (Silver Wattle) <i>Eucalyptus tereticornis</i> (Queensland Blue Gum) <i>Salsola australis</i> (Roly Poly) <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark)	None recorded
Void	<i>Heteropogon contortus</i> (Blackheaded Speargrass) <i>Sporobolus australasicus</i> (Australian Dropseed)	<i>Melinis repens</i> (Red Natal) <i>Chloris gayana</i> (Rhodes Grass)	<i>Macroptilium atropurpureum</i> (Siratro) <i>Sida fibulifera</i> (Pin Sida) <i>Phyllanthus maderaspatensis</i> (Spurge) <i>Stylosanthes hamata</i> (Caribbean Stylo) <i>Achyranthes aspera</i> (Chaff Flower) <i>Desmodium trichostachyum</i> <i>Bidens Pilosa</i> (Farmers Friend) <i>Stylosanthes scabra</i> (Shrubby Stylo) <i>Rhynchosia minima</i> (Rhyncho)	<i>Acacia holosericea</i> (Silver Wattle) <i>Acacia salicina</i> (Sally Wattle) <i>Salsola australis</i> (Roly Poly) <i>Corymbia erythrophloia</i> (Red Bloodwood) <i>Acacia disparrima</i> (Hickory Wattle) <i>Eucalyptus tereticornis</i> (Queensland Blue Gum) <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark)	None recorded

6.4 Fractional vegetation cover

The PRCP proposes the use of satellite-derived fractional vegetation cover monitoring (FVC) for all rehabilitation areas designated as a 'low intensity grazing' PMLU. As such, the following rehabilitation areas were monitored using FVC:

- WRD;
- ROM;
- Office;
- Diversion Bund; and
- Exploration Drilling.

The Sediment Dam was removed from the assessment, given that it is periodically inundated with water and consequently terrestrial vegetation naturally dies off. The behaviour of this area is not consistent with the reference locations and as such would be inappropriate to compare to reference locations. Additional reference sites have been selected to reflect the PMLU accurately. Given the practicalities of field monitoring, transects are often located within the boundaries of the relevant mining lease. However, current rehabilitation transects are not representative of a grazing land use, with two of the four transects located in tree-dominant areas, with significant management works required to convert these areas into productive grazing land. As such, nearby areas currently utilised for cattle grazing have been selected to ensure an accurate assessment of the rehabilitation area's ability to achieve the proposed final land use. The areas selected were located at the Spyglass Beef Research Station and are considered representative of the grazing land use outcome to be achieved by rehabilitation at Lucky Break.

The PRCP proposes a descriptive target for FVC modelling, namely that '...rehabilitation polygons have a median FVC greater than the first quartile of reference polygons for at least 85% of all sample time...' (from here on described as the 'performance target'). In determining median FVC, the total cover for each rehabilitation area was calculated by summing the photosynthetic and non-photosynthetic fractions of each pixel and calculating the median value of all pixels located within the rehabilitation area.

Satellite imagery was sampled from 1 January 2021 to 1 July 2023. This sampling period was selected on the basis that the majority of vegetation cover at Lucky Break had begun to stabilise during this period. It should be noted that some rehabilitation areas have experienced erosion due to excessive stormwater flows arising from the drainage conditions existing prior to this monitoring program; which directed significant catchment flows to the void. As of late 2022, drainage modifications have been implemented to limit and redirect stormwater flows away from the final void. Therefore, it is expected that the selected period will represent actual rehabilitation trends, primarily unaffected by water releases from the final void. The total cover results derived from the FVC modelling are presented in Table 12.

Exploration Drilling was the only area that met the performance target, with 100% of all monitoring points exceeding the 1st quartile of the reference areas. This result is followed by the Office area at 75.8%. Rehabilitation at the ROM area performed below target, with a median value of 49.8%, significantly lower than the values recorded at the rehabilitation transect (see Table 9). The Diversion Bund and WRD areas failed to achieve the performance target, recording below 20% at all sites. A time series analysis of each rehabilitation area is presented in Figure 8 to Figure 13.

Table 12: FVC-derived total cover statistics and performance against reference sites

Rehabilitation area	1 st quartile (%)	Median (%)	3 rd quartile (%)	Performance against target (%)
WRD	12.7	36.7	59.0	6.06
ROM	25.1	49.8	69.4	39.4
Sediment Dam	48.4	72.4	100	-
Office	38.1	63.4	79.5	75.8
Diversion Bund	16.7	33.8	54.2	9.09
Exploration Drilling	26.2	87.0	97.6	100

When considering these figures, most rehabilitation areas have either met or are progressing towards the performance target of 85%. The Exploration Drilling rehabilitation area has reached stability, maintaining consistent cover across the period, alternating between non-photosynthetic and photosynthetic cover in line with rainfall events. The Office, ROM and Sediment Dam rehabilitation areas fluctuate throughout the period, with increases in bare soil fractional cover during rainfall, likely tied to washout and ponding arising from the void overflowing. Rehabilitation performance at the Diversion Bund and WRD areas has remained poor, with little indication of improvement. Given the function of the Diversion Bund, such a result is expected given the amount of water which travels along it. However, the WRD performance suggests that further rehabilitation works may be required within the area to improve rehabilitation performance.

When considering the discrepancies between the transect ground cover (Table 9) and the modelled FVC for the rehabilitation areas (Table 12), it is reasonable to conclude that there is some variance within rehabilitation areas. Of note, the Sediment Dam and ROM rehabilitation areas were all impacted previously by overflows from the final void, which have impacted vegetation establishment and growth. As shown in Figure 10, Figure 11 and Figure 12, rainfall events have led to increases in the bare soil fraction. As rehabilitation transects aim for long-term monitoring, they have been placed in such a way as to ensure they will not be required to be relocated, with the goal of providing accurate and consistent monitoring of rehabilitation performance over the entirety of rehabilitation monitoring.

The change to a polygon-based sampling method results in a complete assessment of the rehabilitation areas, including areas of erosion and ponding.

Overall, while the majority of rehabilitation areas are not meeting the target prescribed in the draft PRCP, recent works on-site have seen improvements in vegetation performance, with trends indicating the achievement of the rehabilitation target ascribed to satellite-based FVC modelling.

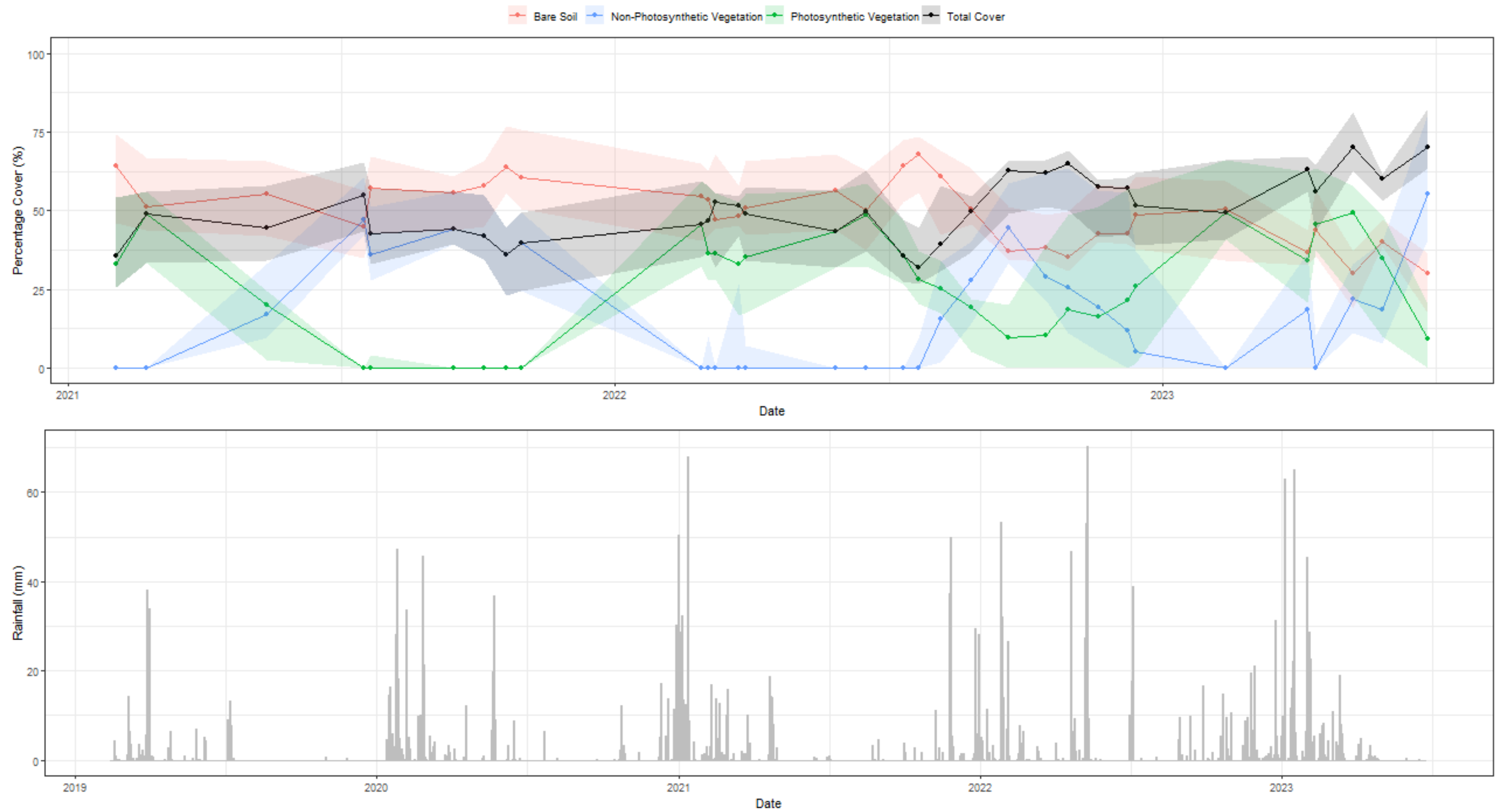


Figure 8: FVC performance of the Diversion Bund rehabilitation area

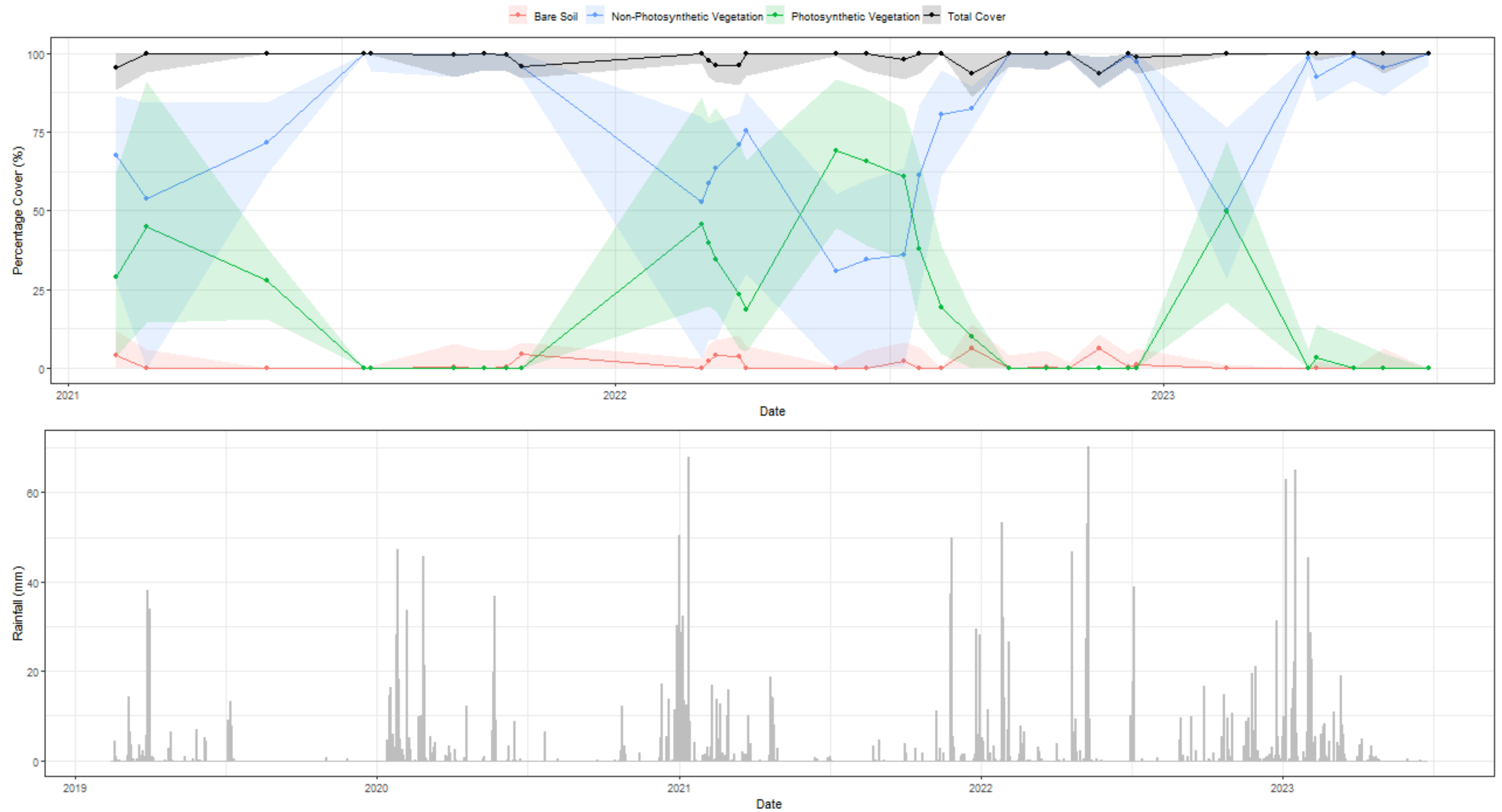


Figure 9: FVC performance of the Exploration Drilling rehabilitation area

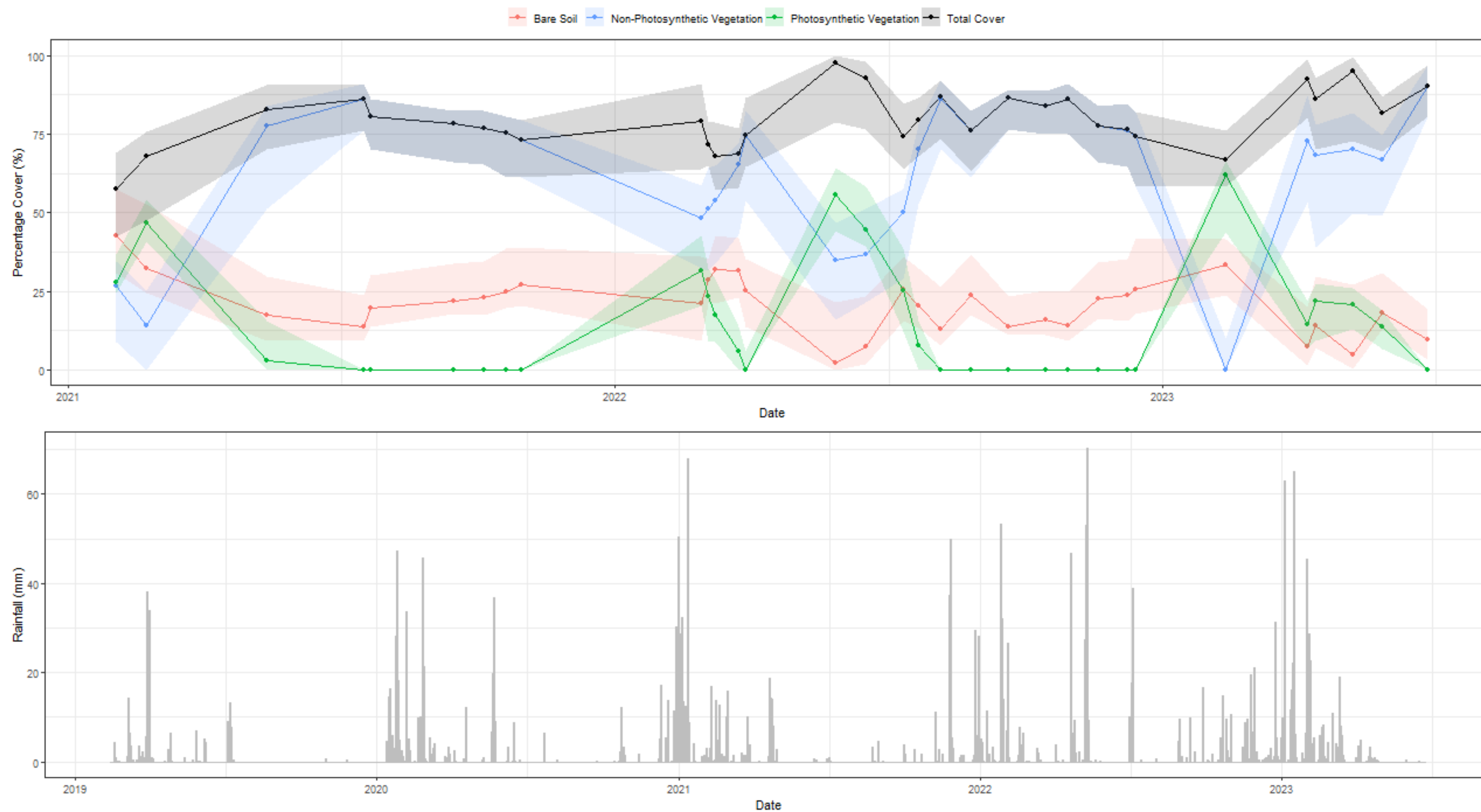


Figure 10: FVC performance of the Office rehabilitation area

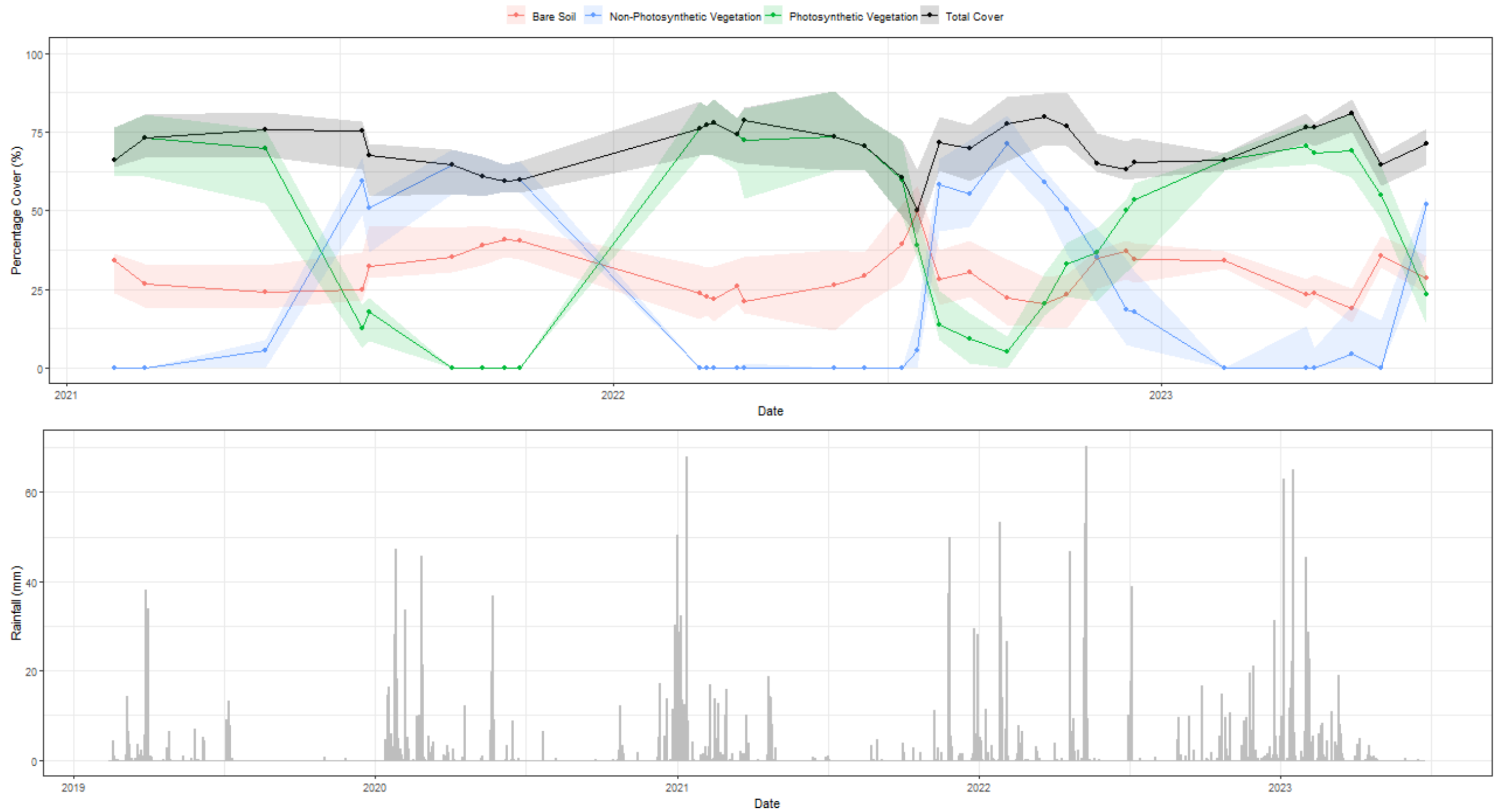


Figure 11: FVC performance of the ROM rehabilitation area

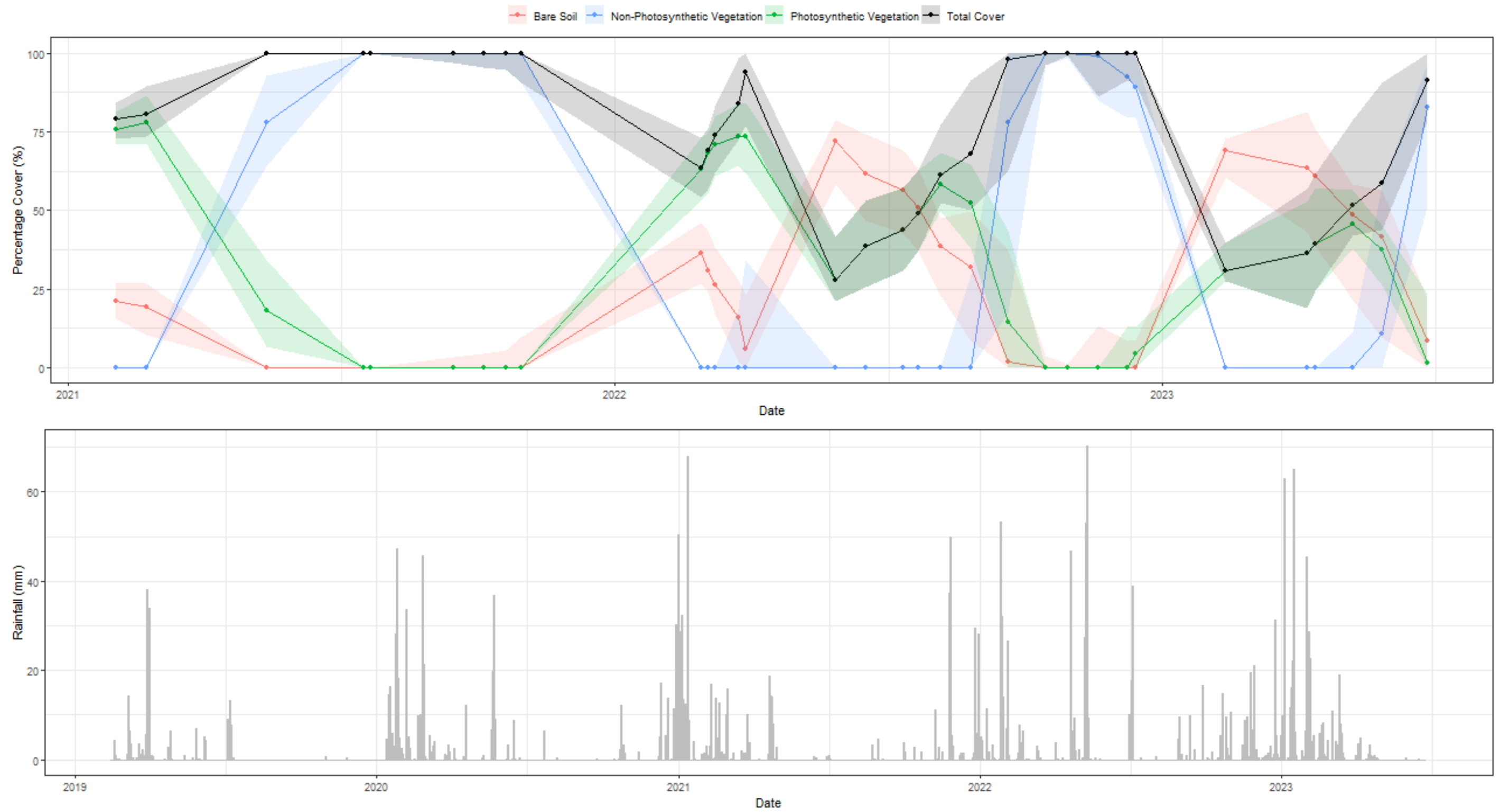


Figure 12: FVC performance of the Sediment Dam rehabilitation area

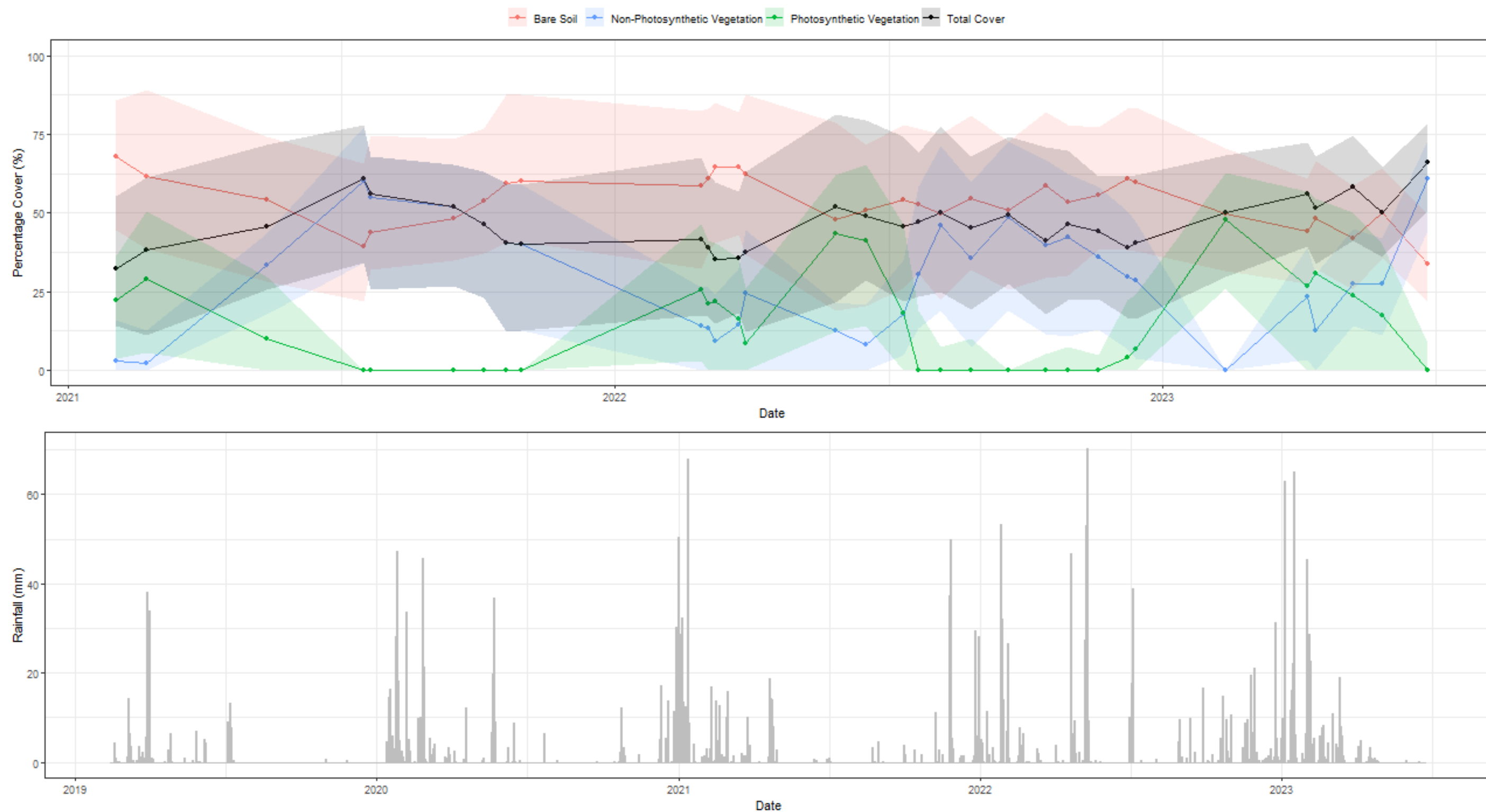


Figure 13: FVC performance of the WRD rehabilitation area

6.5 Soils

The results from the soils analysis are provided in Table 13. The following guidelines were used to assist in interpretation of the soil results:

- *Interpreting Soil Test Results* (Hazelton & Murphy 2016);
- soil testing and some soil test interpretations used by the Queensland Department of Primary Industry (Rayment & Bruce 1984);
- *A classification of soil aggregates based on their coherence in water* (Emerson 1967); and
- *Standard Soil Test Methods and Guidelines for Interpretation of Soil Results* (Government of South Australia 2013).

Soil pH influences the availability of plant available nutrients and toxic elements by controlling the solubility of these elements. At extreme pH values, the availability of essential plant nutrients can be severely reduced while toxic elements can become mobile within the soil solution in acidic environments. In general, a suitable soil pH ranges from 5.5–9.0 as at this pH all essential nutrients are available to some degree (Hazelton & Murphy 2016). The pH of soils across the Project ranged between 6.20 – 7.55 (Table 13), indicating that the pH of soils at the Project are suitable for plant growth.

Soil salinity is determined by measuring the EC of soil:water suspensions in soil. This provides an indication of the presence of water-soluble salts, including sodium, calcium and magnesium, which can exist as chlorides, sulphates or carbonates in the soil profile. EC of soils have been converted to a salinity rating based on the methodology of Hazelton and Murphy (2016) (Table 14). EC_{sat} of the Project soils indicate that soils are predominantly non-saline and suitable for plant growth. EC_{sat} of soils at the Sediment Dam are highly variable, and are considered highly saline, with soils suitable for tolerant plants only. Site observations indicate that areas of bare soils are likely to constitute subsoil material as a result of construction of the Sediment Dam walls.

Chloride is associated with EC as soluble salts contain chloride, thus the presence of soluble salts in soils is directly proportional to chloride in soil. A high chloride concentration can induce chloride toxicity and interfere with the osmotic capacity of plants. Using the chloride ratings by Rayment & Bruce (1984), the chloride concentrations of the soils of the Project are considered low, with the exception of the WRD and Sediment Dam samples.

Cation Exchange Capacity (CEC) is an indication of the capacity of a soil to adsorb cationic nutrients to the surface of soil particles. This process of adsorption prevents nutrients leaching from the soil and buffers the concentration of plant available nutrients in the soil solution. A high soil CEC contributes to larger quantities of exchangeable cations (Ca, K, Mg, Na) being available (Hazelton & Murphy 2016). The CEC of soils ranges from low to medium.

Exchangeable sodium percentage (ESP) is defined as the amount of exchangeable sodium as a percentage of the total CEC of the soil. It provides a measure of how much of the CEC of the soil is dominated by sodium. Due to the chemical characteristics of sodium ions, an increasing ESP indicates increasing sodicity thus increasing the risk of dispersion. According to the ratings of Hazelton and Murphy (2016) all soils report a non-sodic ESP rating, indicating that soils are non-dispersive.

Organic matter is an essential constituent of soil. It is an important component of microbial processes and nutrient cycling. Furthermore, it contributes to the ability of a soil to buffer changes to pH and nutrient content and supports the aggregation of soils thereby improving the structural stability of the soil. The percentage of organic matter reported within the Project soils in 2022 was high.

Trace elements such as copper, iron, manganese, zinc and boron are essential nutrients required for plant growth, although needed in much smaller quantities than exchangeable cations. Table 15 provides trace element/metal ratings sourced from the Government of South Australia (2013). The Project soils demonstrate ideal trace element concentrations for plant growth.

Nitrate and sulphate are essential nutrients for plant growth. Nitrate in soils, including reference locations is considered low (Hazelton & Murphy 2016), with values reported less than 7 mg/kg for nitrate. In comparison, sulphate concentrations reported high concentrations across all monitoring locations.

The Emerson aggregate test class is a class assigned to soil that is determined on the stability of dry aggregates in water. The Emerson class of a soil is assigned as an indication of the dispersion and slaking ability of a soil. Table 16 below describes the Emerson Dispersion Class (Emerson 1967). Emerson ratings were highly variable across the mine domains, with soils of the Void, ROM pad and WRD recording an Emerson class 2 with slaking and some dispersion. This result is supported by the field observations, with higher levels / ratings of erosion also reported at these domains. Emerson class ratings at the Office, Sediment Dam and reference locations indicate soils here are not subject to slaking and are either subject to no dispersion or minor dispersion.

Table 13: Soil monitoring results 2022

Parameter	Unit	WRD	ROM	Void	Office	Sed dam	Ref
pH	ph	6.73	7.55	8.13	6.20	7.05	6.40
EC	dS/m	0.33	0.03	0.07	0.01	1.64	0.02
EC sat	dS/m	2.51	0.23	0.55	0.09	14.10	0.18
pH (calcium chloride)	-	6.13	6.60	7.37	5.10	6.30	5.55
Moisture content;	%	4.50	11.95	7.03	1.20	14.90	3.33
Emerson aggregate stability test;	-	2	2	2	7	4	5
Exchange acidity	m _{eq} /100 g	0.30	-	-	-	0.10	0.10
Exchangeable aluminium	m _{eq} /100 g	0.10	-	-	-	0.10	0.10
Calcium/magnesium ratio	-	0.43	0.20	0.43	0.80	0.55	1.53
Cation exchange capacity	m _{eq} /100 g	21.50	20.45	16.63	6.10	14.45	12.43
Exchangeable calcium	m _{eq} /100 g	4.17	3.20	5.10	2.40	4.40	6.23
Exchangeable magnesium	m _{eq} /100 g	15.57	16.20	11.10	3.20	7.50	5.60
Exchangeable potassium	m _{eq} /100 g	0.63	0.65	0.37	0.30	0.80	0.43
Exchangeable sodium	m _{eq} /100 g	1.07	0.40	0.20	0.10	1.70	0.10
Exchangeable sodium percent	%	0.11	0.02	0.14	0.02	0.15	0.03
Magnesium/potassium ratio	-	25.83	24.85	19.15	12.00	9.45	11.15
Bicarbonate extractable K (Colwell)	mg/kg	623.67	590.00	279.67	303.00	676.00	371.25
Silica	mg/kg	103.00	117.00	103.00	39.00	102.00	60.50
Silicon	mg/kg	47.67	54.50	48.33	18.00	47.50	28.25
Sulphate as SO ₄ ²⁻	mg/kg	133.33	10.00	10.00	10.00	130.00	10.00
Sulphur as S	mg/kg	46.67	10.00	10.00	10.00	45.00	10.00
Chloride	mg/kg	373.33	10.00	26.67	10.00	3,005.00	10.00
Boron	mg/kg	0.23	0.20	0.20	0.20	1.20	0.20
Copper	mg/kg	1.58	1.48	1.00	1.00	2.25	1.22
Iron	mg/kg	60.70	25.85	11.17	34.40	131.05	44.20
Manganese	mg/kg	53.34	12.65	5.04	12.30	36.40	33.43

Parameter	Unit	WRD	ROM	Void	Office	Sed dam	Ref
Zinc	mg/kg	1.11	2.12	1.00	1.00	1.36	1.47
Aluminium	mg/kg	5,410.00	5,050.00	5,086.67	3,110.00	3,650.00	4,625.00
Chromium	mg/kg	223.00	385.00	417.67	63.80	255.00	109.68
Cobalt	mg/kg	144.83	305.00	142.17	15.10	149.40	87.85
Molybdenum	mg/kg	0.43	0.40	0.37	0.50	0.30	0.43
Nickel	mg/kg	1,743.67	4,515.00	1,806.67	120.00	759.00	665.03
Selenium	mg/kg	1.00	1.50	1.00	1.00	1.00	1.00
Ammonia as N	mg/kg	30.00	20.00	20.00	20.00	20.00	20.00
Nitrite as N (Sol.)	mg/kg	0.50	0.10	0.10	0.20	0.10	0.28
Nitrate as N (Sol.)	mg/kg	10.20	0.30	4.07	0.60	7.40	1.08
Nitrite + Nitrate as N (Sol.)	mg/kg	10.47	0.30	4.07	0.80	7.40	1.35
Total Kjeldahl Nitrogen as N	mg/kg	570.00	395.00	293.33	500.00	1,405.00	1,302.50
Total nitrogen as N	mg/kg	580.00	395.00	296.67	500.00	1,415.00	1,302.50
Total phosphorus as P	mg/kg	185.67	131.00	129.00	150.00	205.50	183.25
Bicarbonate Ext. P (Colwell)	mg/kg	11.67	5.00	5.00	5.00	24.50	6.00
Organic matter	g/100g	74	10	17	10	4	3
Total organic carbon	%	0.17	0.01	0.34	0.01	0.03	0.02

Table 14: Salinity ratings for soil based on EC_{SAT} (Hazelton & Murphy 2016)

Rating	EC_{SAT} dS/m	Effect on plants
Non-saline	< 2	Salinity effects are mostly negligible
Slightly saline	2 – 4	Yields of sensitive crops are affected
Moderately saline	4 – 8	Yields of many crops are affected
Highly saline	8 – 16	Only tolerant crops yield satisfactorily
Extremely saline	> 16	Only very tolerant crops yield satisfactorily

Table 15: Ideal concentration ranges for trace elements/metals (Government of South Australia 2013)

Trace element/metal	Rating	Concentration (mg/kg)
Boron	Low	< 0.5
	High	> 15
Copper	Low	< 0.3

Trace element/metal	Rating	Concentration (mg/kg)
	High	> 1
Iron	Low	< 10
	High	> 70
Manganese	Low	< 1
	High	> 10
Zinc	Low	< 0.5
	High	> 1

Table 16: Emerson aggregate test classes (Emerson 1967)

Emerson test class	Level of dispersion and or slaking
1	Slaking and complete dispersion
2	Slaking and some dispersion
3	Slaking and no dispersion
4	CaCO ₃ /CaSO ₄ present. No dispersion at field capacity
5	No CaCO ₃ /CaSO ₄ present. No dispersion at field capacity, however, dispersion in an aggregate-water suspension
6	No CaCO ₃ /CaSO ₄ present. No dispersion at field capacity, however, flocculation in an aggregate-water suspension
7	No slaking and swelling
8	No slaking and no swelling

6.6 Slope analysis

A slope analysis of the final landform at a 25 m pixel resolution was performed to determine the maximum slope at various locations across the rehabilitated landform (Figure 14). Slope analysis indicates that slopes are:

- between 3° and 19° at the WRD (Figure 15); and
- is typically less than 23° at the Void (Figure 16).

Slope analysis indicates that the final landform meets the target criteria of slopes ≤36° at the WRD.

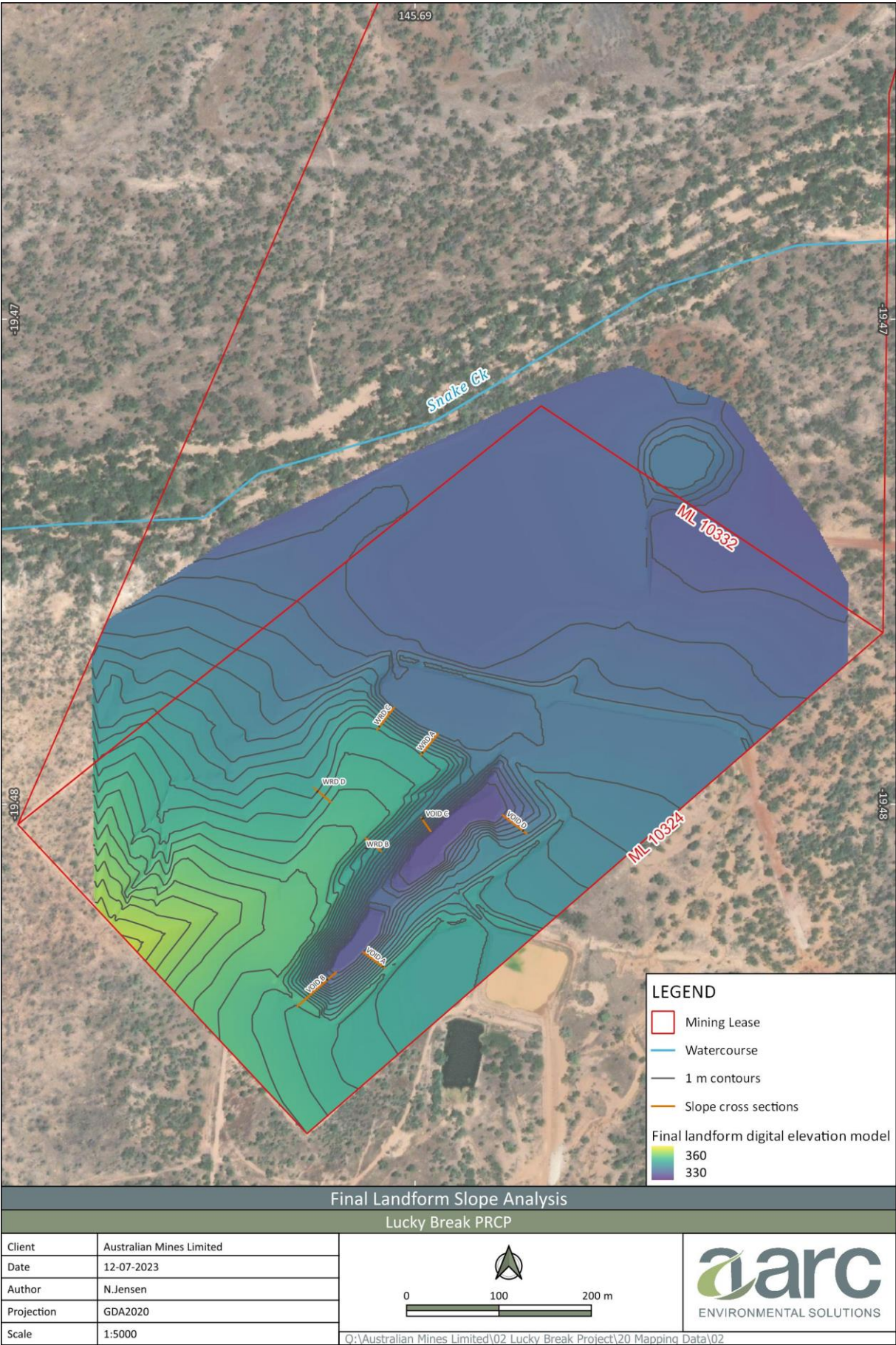
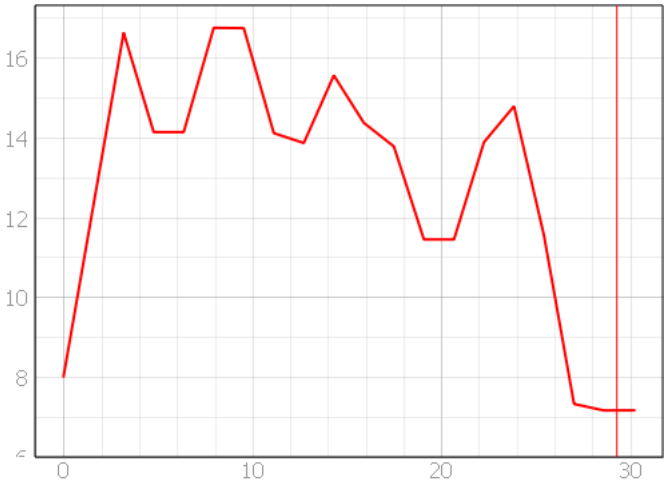
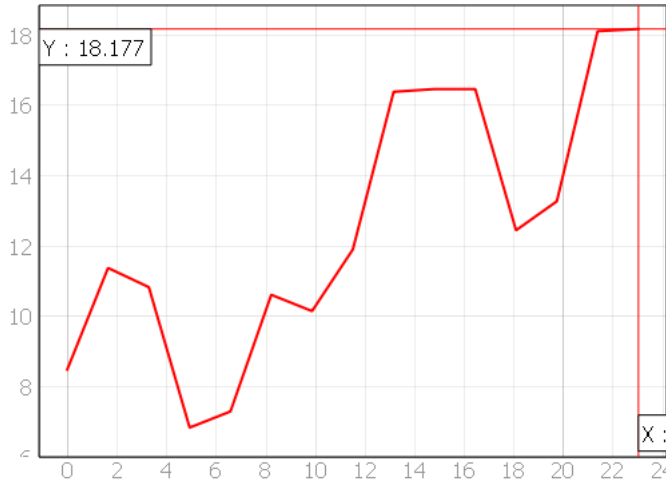


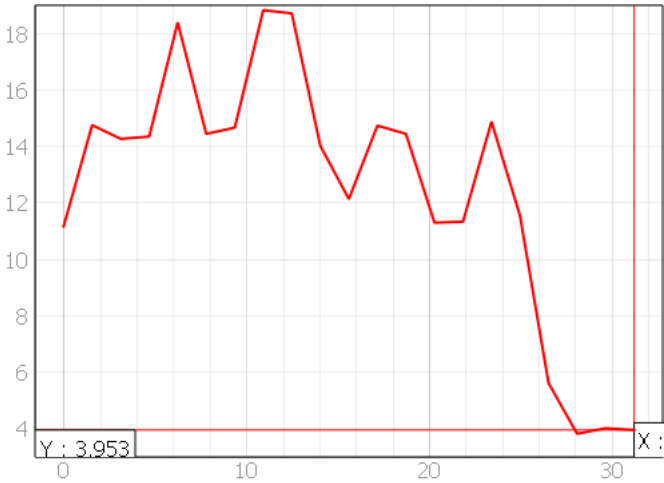
Figure 14: Final landform slope analysis, cross-section locations



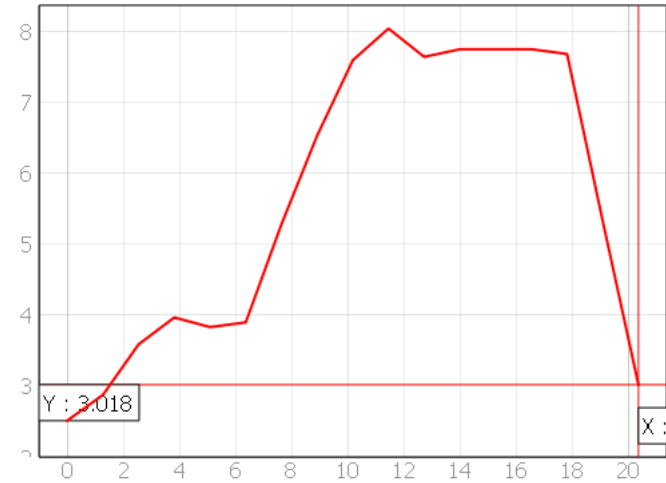
WRD cross-section A



WRD cross-section B

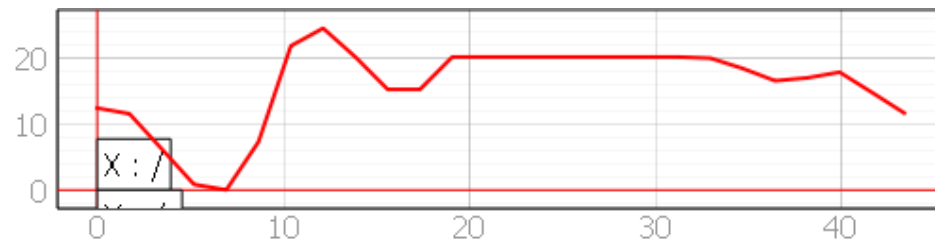


WRD cross-section C

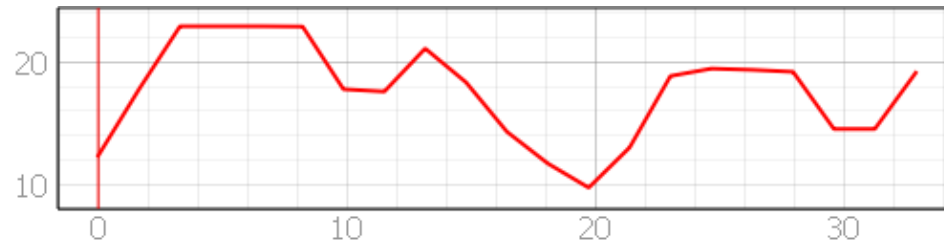


WRD cross-section D

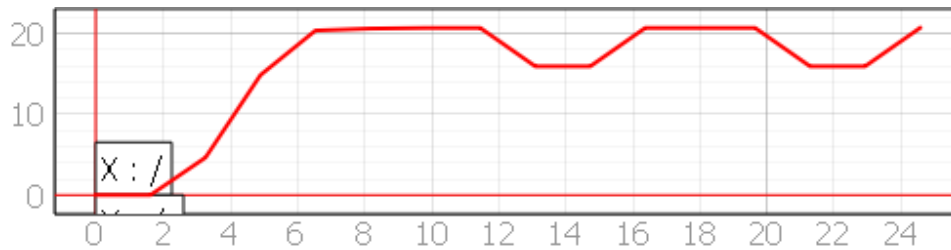
Figure 15: Slope profile of the WRD (note the exaggeration of the vertical axis)



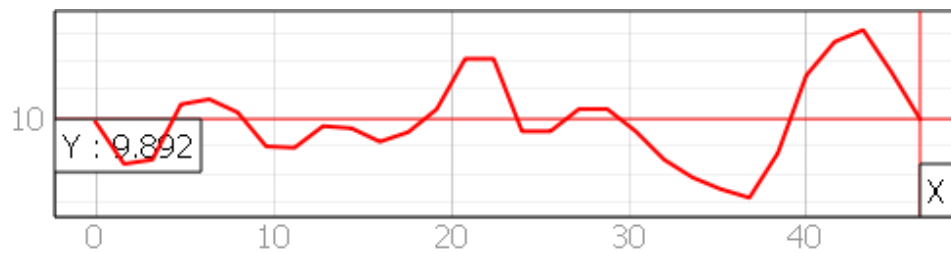
Void cross-section A



Void cross-section B



Void cross-section C



Void cross-section D

Figure 16: Slope profile of the Void (note the exaggeration of the vertical axis)

6.7 Erosion monitoring

In accordance with the PMLUP, the final landform is required to be in a stable state prior to relinquishment of the mining lease. Erosion is used as a measure of landform stability. Erosion at the reference sites is minor, with soils exhibiting normal levels of cracking characteristic of seasonal inundation and drying.

All of the rehabilitation monitoring sites, with the exception of WRD 1 and WRD 2 demonstrate erosion characteristics similar to the reference sites. Erosion at 10 of the 12 rehabilitation monitoring sites meets the completion criteria of no erosion rills deeper than 30 cm. A minor number of erosion rills and moderate depth of erosion was reported at WRD 1, that is less than 15 erosion rills were recorded with depths ranging between 10-30 cm. A moderate number of erosion rills with a severe depth classification were reported at WRD 2, that is between 15-30 erosion rills were present with depths of up to / between 30–60 cm.

Table 17: Erosion monitoring results 2022

Monitoring location	Number of rills/gullies classification	Average rill depth classification	Completion criteria achieved (Y/N)
REF 1	N/A	N/A	N/A
REF 2	Minor	Minor	N/A
REF 3	Minor	Minor	N/A
REF 4	Minor	Minor	N/A
WRD 1	Minor	Moderate	N
WRD 2	Moderate	Severe	N
WRD 3	Minor	Minor	Y
ROM 1	Minor	Minor	Y
ROM 2	Minor	Minor	Y
OFFICE 1	Minor	Minor	Y
OFFICE 2	Minor	Minor	Y
SED DAM 1	Minor	Minor	Y
SED DAM 2	Minor	Minor	Y
VOID 1	Minor	Minor	Y
VOID 2	Minor	Minor	Y
VOID 3	Minor	Minor	Y

6.8 ML10332 photographic monitoring

Disturbance on the Lucky Break ML has been limited to historic exploration activities in 2004 and 2005. Areas disturbed by exploration activities have been rehabilitated and show good vegetation cover. Aerial imagery and field photographs indicate that vegetative cover is representative of the surrounding environment. No evidence of drillhole location or residual drilling disturbance was noted.



Figure 17: DRILL 1 monitoring location 2022



Figure 18: DRILL 2 monitoring location 2022



Figure 19: *DRILL 3 monitoring location 2022*



Figure 20: NORTH REF 1 monitoring location 2022



Figure 21: NORTH REF 2 monitoring location 2022

7 Conclusions and recommendations

Rehabilitation monitoring at the Project in 2022 indicates that the site meets the target vegetation and landform stability criteria across most domains (Table 18), where:

- Total ground cover at rehabilitation sites meets the target criteria of 68.7% at only the ROM pad and Sediment Dam monitoring location only. Groundcover was reported between 59.8% at the Void to 93.9% at the ROM pad. It is recommended that areas of low vegetative cover at the Void, Sediment Dam and WRD be reseeded.
- All rehabilitation sites meet the target completion criteria for species diversity of pasture grasses (1.1%) and forbs (3.5%). Average species diversity at rehabilitation sites ranges between 2.3% at the Void for pasture grasses and 4% at the Office and 6% at the WRD for forbs.
- Reference monitoring locations report a higher diversity and cover of trees and shrubs compared to rehabilitation locations, which is expected given that the target PMLU is a grazing landscape. An increase in tree cover would result in a decrease in ground cover for grazing pasture.
- Two weed species were recorded at reference monitoring locations and only one species reported at the ROM pad, the Stinking Passionflower. All rehabilitation sites meet the completion criteria for weeds.
- Analysis of FVC indicates that most rehabilitation areas have either met or are progressing towards the performance target of 85%. Exploration drilling areas meet the FVC performance target, with 100% of all monitoring points exceeding the 1st quartile of reference sites.
- The Sediment Dam and ROM rehabilitation areas were all impacted previously by overflows from the final Void causing erosion and ponding in rehabilitation areas, which, in some cases, has impacted vegetation establishment and growth. As a result, it is noted that there is a discrepancy between the measured transect ground cover (Table 10) and the modelled FVC for the rehabilitation areas (Table 8) due to the variance within rehabilitation areas historically subject to washout.
- An analysis of the key characteristics of soils at rehabilitation sites indicate that soils have similar characteristics as reference locations. Soils at rehabilitation sites are considered suitable for vegetative growth. Some soils, in particular at the WRD have an Emerson class rating which indicates that they may be susceptible to dispersion.
- Erosion monitoring indicates that erosion at the site is limited to the classification of 'minor' in relation to the number of erosion rills and depth of erosion. Erosion at all monitoring sites meet the completion criteria, with the exception of the WRD. Reparation activities are recommended at this location.
- Slope analysis indicates that the landform design criteria of WRD slopes of less than 36° has been achieved.
- Photographic monitoring at ML10332 indicates that vegetative cover at rehabilitation sites is comparable to reference locations.

Table 18: Achievement of revegetation and landform completion criteria

Parameter	Revegetation completion criteria	Criteria achieved (Y/N)	Notes
Vegetation density/percentage of ground cover	Ground cover to be not less than 80% of the average percentage ground cover of analogue sites.	N	Criteria achieved only at the ROM pad and Office monitoring locations.
Diversity of species	Equal to or greater than 60% of the comparable species diversity of analogue sites.	Y	Criteria achieved for forbs, pasture grasses and weeds.
Abundance of weeds	Weeds not to exceed 10% more than average percentage cover of analogue sites.	Y	-
Landforms	No active rill erosion deeper than 30 cm.	N	Criteria achieved at all locations except the WRD.
Landform design	WRD batter slopes are <36° to the angle of repose.	Y	Slope analysis indicates the maximum slope at the site is 24° at the Void and 19° at the WRD.

8 References

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Appendix A. Field photographs



OFFICE 1 monitoring location 2022



OFFICE 2 monitoring location 2022



ROM 1 monitoring location 2022



ROM 2 monitoring location 2022



SED DAM 1 monitoring location 2022



SED DAM 2 monitoring location 2022



VOID 1 monitoring location 2022



VOID 2 monitoring location 2022



VOID 3 monitoring location 2022



WRD 1 monitoring location 2022



WRD 2 monitoring location 2022



WRD 3 monitoring location 2022



REF 1 monitoring location 2022



REF 2 monitoring location 2022



REF 3 monitoring location 2022



REF 4 monitoring location 2022

Appendix E. Provided technical studies

The following documents have been provided as relevant supporting technical studies:

- Final Void Water Studies including geotechnical WRD study, ATC William 2019
- Plan of Operations 2018 – 2023, AARC Environmental Solutions Pty Ltd (AARC) 2018
- Post Closure Management Plan, AARC Environmental Solutions Pty Ltd (AARC) 2020
- Post Mining Land Use Plan, AARC Environmental Solutions Pty Ltd (AARC) 2020
- Rehabilitation Monitoring Report, AARC Environmental Solutions Pty Ltd (AARC) 2023
- Soils and land suitability assessment, AARC Environmental Solutions Pty Ltd (AARC) 2006
- Spyglass Landholder Statement, 2019
- Stormwater Management Plan, ATC Williams 2019
- Topsoil Assessment Letter, AARC Environmental Solutions Pty Ltd (AARC) 2019

Appendix F. Rehabilitation Risk Assessment

Ref.	Risk Description				Control Effectiveness	Risk		Safety/ Health Environment	Risk	Count				Final Risk Rating					
	Category	Subcategory	Item	Risk Scenario/Threat Title		Caused by ... (Triggers / Indicators)	Resulting in ... (Impacts / Consequences)			Typically controlled by ... (Controls)	Likelihood - Frequency	Likelihood - Probability	Safety/ Health Environment		Safety/ Health Environment				
																IV	III	II	I
T A	Mine infrastructure area																		
T A 01	Safe																		
T A 01 01				Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Inadequate pre-revegation surface preparation, localised settlement, erosion gullies	Safety hazard for personnel, stock and wildlife	Adequacy of existing rehabilitation, monitoring and maintenance controls, reparation as required.	C1	P	VL	I	0	0	0	1	I			
T A 02	Stable - geotechnical risk																		
T A 02 01				Not applicable								0	0	0	0				
T A 03	Stable - erosional risk																		
T A 03 01				Uncontained gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils and subsoils, adverse weather events, failure of stormwater management controls	Localised land impacts, downstream water quality impacts	MIA area consists of very low slopes; effectiveness of intial revegetation establishment, revegetation monitoring and anagement as required.	C2	U	L	I	0	0	0	1	I			
T A 04	Non-polluting - geochemical risk																		
T A 04 01				Contaminants from ore materials on ROM pad or haul road	Acid, saline or other contaminated drainage from extracted ores	Release of contaminants to receiving environment	No processing occurred on site. All extracted ore removed from site.	C1	U	L	I	0	0	0	1	I			
T A 05	Non-polluting - other environmental harm																		
T A 05 01				Contaminants from buildings/workshop areas and laydown areas	Hydrocarbon or heavy metal contamination from operational activities at infrastructure areas	Release of contaminants to receiving environment	Removal of all plant equipment and materials from site at cessation of mining, limited scale and duration of operations, management plans in use.	C1	U	L	I	0	0	0	1	I			
T A 06	Sustainable - PMLU																		
T A 06 01				Insufficient vegetation cover and species diversity to allow for the nominated PMLU	Poor vegetation establishment (poor soils, climate, poor management)	Insufficient pasture productivity to enable PMLU	Grazing management; vegetation improvement where required.	C1	P	L	II	0	0	1	0	II			
T A 06 02				Pest and weed invasion	Poor local, regional or site property management practices, weed invasion	Increased risk of not achieving designated PMLU	Property and site pest and weed management practices, rehabilitation monitoring and landholder communication to provide for early detection and management	C1	P	L	II	0	0	1	0	II			
T B	Water management infrastructure - Sediment dam																		
T B 01	Safe																		
T B 01 01				Landform retains excessive surface roughness or muddiness	Erosion gullies in wall, excessive retained sedimentation	Safety hazard for personnel, stock and wildlife	No current evidence of excessive surface roughness or muddiness	C1	R	L	I	0	0	0	1	I			
T B 02	Stable - geotechnical risk																		
T B 02 01				Not applicable								0	0	0	0				
T B 03	Stable - erosional risk																		
T B 03 01				Uncontained gully, pipe and/or sheet erosion of wall areas	Erodible subsoils; adverse weather events; excessive upstream erosion (on and off-lease)	Localised land impacts; downstream water quality impacts	Sediment dam area consists of very low slopes, with established vegetation on dam walls that are an unobtrusive structure, revegetation monitoring and management as required.	C1	U	L	I	0	0	0	1	I			
T B 03 02												0	0	0	0				
T B 04	Non-polluting - geochemical risk																		
T B 04 01				Not applicable						VL		0	0	0	0				
T B 05	Non-polluting - other environmental harm																		
T B 05 01				Excessive depth/ volume of retained sediments	Erodible subsoils; adverse weather events; excessive upstream erosion (on and off-lease)	Localised land impacts; downstream water quality impacts	Upstream stabilisation measures, desilting of structure during operations	C1	P	L	II	0	0	1	0	II			

Ref.	Risk Description				Control Effectiveness	Risk		Risk		Count				Final Risk Rating				
	Category	Subcategory	Item	Risk Scenario/Threat Title		Caused by ... (Triggers / Indicators)	Resulting in ... (Impacts / Consequences)	Typically controlled by ... (Controls)	Likelihood - Frequency	Likelihood - Probability	Safety/ Health Environment	Safety/ Health Environment						
													IV		III	II	I	
T B 06				Sustainable - PMLU														
T	B	06	01	Insufficient vegetation cover and species diversity to allow for the nominated PMLU	Poor vegetation establishment, excessively wet ground conditions	Insufficient pasture productivity to enable PMLU	Grazing management, pasture performance monitoring, vegetation mitigation where required.	C1	U	L		I	0	0	0	1	I	
T	B	06	02	Pest and weed invasion	Poor local, regional or site property management practices, weed invasion	Increased risk of not achieving designated PMLU	Property and site pest and weed management practices, rehabilitation monitoring and landholder communication to provide for early detection and management	C1	P	L		II	0	0	1	0	II	
T C				Water management infrastructure - Dingo Dam														
T C 01				Safe														
T	C	01	01	Overtopping of water contained in dam	Extreme rainfall events	Downstream hazard to public	Consequence category for overtopping assessed as 'Low'; not a mine structure; small contributor to system volumes; water in Dingo Dam is 'clean' water	C1		R	L		I	0	0	0	1	I
T C 02				Stable - geotechnical risk														
T	C	02	01	Wall failure/dam break of retained structures	Extreme rainfall events	Downstream hazard to public	Consequence category for overtopping assessed as 'Low'; not a mine structure; small contributor to system volumes; water in Dingo Dam is 'clean' water	C1		R	M		II	0	0	1	0	II
T C 03				Stable - erosional risk														
T	C	03	01	Not applicable										0	0	0	0	
T C 04				Non-polluting - geochemical risk														
T	C	04	01	Not applicable										0	0	0	0	
T C 05				Non-polluting - other environmental harm														
T	C	05	01	Not applicable										0	0	0	0	
T C 06				Sustainable - PMLU														
T	C	06	01	Not applicable										0	0	0	0	
T D				Water management infrastructure - stormwater management system														
T D 01				Safe														
T	D	01	01	Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Challenging local subsoils/ topsoils, erosion gullies	Safety hazard for personnel and wildlife	Recent review of stormwater management system recommended various improvements to be implemented; monitoring and maintenance controls	C1		U	VL		I	0	0	0	1	I
T D 02				Stable - geotechnical risk														
T	D	02	01	Failure of structure(s)	Not constructed to design, adverse rainfall event	Localised land impacts and downstream water quality impacts	Small scale structures; engineered design and inspection; monitoring	C1		R	VL		I	0	0	0	1	I
T	D	02	02											0	0	0	0	
T D 03				Stable - erosional risk														
T	D	03	01	Uncontained gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils and subsoils; adverse weather events	Localised land impacts; downstream water quality impacts	Prompt revegetation establishment (new works include hydroseeding); revegetation monitoring and management	C1		U	L		I	0	0	0	1	I
T D 04				Non-polluting - geochemical risk														
T	D	04	01	Not applicable										0	0	0	0	
T D 05				Non-polluting - other environmental harm														
T	D	05	01	Sediment laden water leaving site	Upstream erosion, insufficient vegetation cover on stormwater management system	Sedimentation, downstream water quality impacts	Prompt revegetation establishment (new works include hydroseeding); revegetation monitoring and management			P	L		II	0	0	1	0	II

Ref.	Risk Description				Control Effectiveness	Risk		Safety/ Health Environment	Safety/ Health Environment	Count				Final Risk Rating			
	Category	Subcategory	Item	Risk Scenario/Threat Title		Caused by ... (Triggers / Indicators)	Resulting in ... (Impacts / Consequences)			Typically controlled by ... (Controls)	Likelihood - Frequency	Likelihood - Probability	IV		III	II	I
T D 06	Sustainable - PMLU																
T D 06 01				Insufficient vegetation cover and species diversity to allow for the nominated PMLU	Poor vegetation establishment, excessively wet ground conditions	Insufficient pasture productivity to enable PMLU	Grazing management, pasture performance monitoring, vegetation mitigation where required.	C1	U	L		I	0	0	0	1	I
T D 06 02				Pest and weed invasion	Poor local, regional or site property management practices, weed invasion	Increased risk of not achieving designated PMLU	Property and site pest and weed management practices, rehabilitation monitoring and landholder communication to provide for early detection and management	C1	P	L		II	0	0	1	0	II
T E	Waste Rock Dump																
T E 01	Safe																
T E 01 01				Surface roughness (rockiness, depressions) in excess of that expected for PMLU	Inadequate pre-revegation surface preparation, localised settlement, erosion gullies	Safety hazard for personnel, stock and wildlife	Adequacy of existing rehabilitation, monitoring and maintenance controls, reparation as required	C1	U	L		I	0	0	0	1	I
T E 01 02													0	0	0	0	
T E 02	Stable - geochemical risk																
T E 02 01				Significant slope failure	Excessive slopes, poor drainage, unsuitable material used on outer slopes, adverse rainfall event(s)	Localised land impacts, downstream water quality impacts	Adequate drainage features, adequacy of existing rehabilitation (including appropriate slopes, use of suitable topsoils on slopes, revegetation)	C1	R	L		I	0	0	0	1	I
T E 03	Stable - erosional risk																
T E 03 01				Uncontained gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils and subsoils, adverse weather events, failure of stormwater management controls	Localised land impacts, downstream water quality impacts	Adequate drainage features, adequacy of existing rehabilitation (including appropriate slopes, use of suitable topsoils on slopes, revegetation), revegetation maintenance and repairs as required, stormwater management plan review	C1	P	L		II	0	0	1	0	II
T E 04	Non-polluting - geochemical risk																
T E 04 01				Acid and saline drainage of waste rocks	Adverse waste rock geochemistry	Revegetation performance impacts, downstream receiving environment water quality and dependent ecosystem impacts	Negative NAPP materials and low risk of saline drainage. Water quality monitoring and assessment meets standard	C1	R	VL		I	0	0	0	1	I
T E 05	Non-polluting - other environmental harm																
T E 05 02				Sediment laden water leaving site	Upstream erosion, insufficient vegetation cover on stormwater management system	Sedimentation, downstream water quality impacts	Prompt revegetation establishment (new works include hydroseeding); effective drainage and sediment capture system; revegetation monitoring and management	C1	U	L		I	0	0	0	1	I
T E 06	Sustainable - PMLU																
T E 06 01				Insufficient vegetation cover and species diversity to allow for the nominated PMLU	Poor vegetation establishment (poor soils, climate, poor management)	Insufficient pasture productivity to enable PMLU	Grazing management; vegetation improvement where required.	C1	P	L		II	0	0	1	0	II
T E 06 02				Pest and weed invasion	Poor local, regional or site property management practices, weed invasion	Increased risk of not achieving designated PMLU	Property and site pest and weed management practices, rehabilitation monitoring and landholder communication to provide for early detection and management	C1	U	L		I	0	0	0	1	I

Ref.	Risk Description				Control Effectiveness	Risk		Safety/ Health Environment	Risk	Count				Final Risk Rating					
	Category	Subcategory	Item	Risk Scenario/Threat Title		Caused by ... (Triggers / Indicators)	Resulting in ... (Impacts / Consequences)			Typically controlled by ... (Controls)	Likelihood - Frequency	Likelihood - Probability	Safety/ Health Environment		Safety/ Health Environment	IV	III	II	I
T F	Exploration area (ML 10332)																		
T F 01	Safe																		
T F 01 01				Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Inadequate pre-revegation surface preparation, localised settlement, erosion gullies	Safety hazard for personnel, stock and wildlife	Surface preparation measures; low impact exploration methodology; reparation where required.	C1	R	VL	I		0	0	0	1		I	
T F 02	Stable - geotechnical risk																		
T F 02 01				Not applicable									0	0	0	0			
T F 03	Stable - erosional risk																		
T F 03 01				Uncontained gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils and subsoils; adverse weather events	Localised land impacts, downstream water quality impacts	Exploration area consists of very low slopes and very minor disturbance; effectiveness of initial revegetation establishment, revegetation monitoring and management as required	C1	R	VL	I		0	0	0	1		I	
T F 04	Non-polluting - geochemical risk												0	0	0	0			
T F 04 01				Not applicable									0	0	0	0			
T F 05	Non-polluting - other environmental harm												0	0	0	0			
T F 05 01				Not applicable									0	0	0	0			
T F 06	Sustainable - PMLU																		
T F 06 01				Insufficient vegetation cover and species diversity to allow for the nominated PMLU	Poor vegetation establishment (poor soils, climate, poor management)	Insufficient pasture productivity to enable PMLU	Grazing management; vegetation improvement where required.	C1	R	VL	I		0	0	0	1		I	
F 06 02				Pest and weed invasion	Poor local, regional or site property management practices, weed invasion	Increased risk of not achieving designated PMLU	Property and site pest and weed management practices, rehabilitation monitoring and landholder communication to provide for early detection and management	C1	P	L	II		0	0	1	0		II	
T F	Residual void (NUMA)																		
T F 01	Safe																		
T F 01 01				Cattle, humans or wildlife access to the residual void	Insufficient warnings; fencing preventing access to residual void; unauthorised access	Falls, slips, trips impacting humans, livestock and wildlife. Livestock accessing void water for drinking	Fencing, signage and physical barriers; adequacy of initial surface preparation; monitoring of residual void area	C1	U	M	II		0	0	1	0		II	
T F 02	Stable - geotechnical risk																		
T F 02 01				Final void highwalls and low walls subject to significant slope failure	Excessive slopes; inadequate design; not constructed to design; inadequate drainage controls; adverse weather event(s)	Localised land impact	Geotechnical assessment required for completion criteria. Slopes at the batter not to exceed 10 degrees.	C1	R	L	I		0	0	0	1		I	
T F 03	Stable - erosional risk																		
T F 03 01				Uncontained gully, pipe and/or sheet erosion of rehabilitated void batters	Erodible topsoils and subsoils, adverse weather events, failure of stormwater management controls	Localised land impacts, downstream water quality impacts	Adequacy of existing rehabilitation (including appropriate slopes, use of suitable topsoils on slopes, revegetation), revegetation maintenance and repairs as required, stormwater management plan review	C1	P	L	II		0	0	1	0		II	

Risk Type (T=Threat) Category Subcategory Item	Ref.	Risk Description				Control Effectiveness	Risk		Risk		Count				Final Risk Rating			
	T	F	04	01	Risk Scenario/Threat Title		Caused by ... (Triggers / Indicators)	Resulting in ... (Impacts / Consequences)	Typically controlled by ... (Controls)	Likelihood - Frequency	Likelihood - Probability	Safety/ Health Environment	Safety/ Health Environment	IV		III	II	I
T	F	04	01	Water releases from the void containing high dissolved and total metal loads	Extreme rainfall events/wet seasons influencing evaporation and rainfall rates; inappropriate upstream drainage design	Release of contaminants contained within the void to receiving environment	Final void modelling informing upstream drainage design and mitigating void inflows	C1	U	L	I	0	0	0	1			
T	F	05		Non-polluting - other environmental harm								0	0	0	0			
T	F	05	01	NA								0	0	0	0			
T	F	06		Sustainable - NUMA														
T	F	06	01	NA								0	0	0	0			
							Total					0	0	12	22	34		

Appendix G. Rehabilitation Monitoring Report 2023