



Annual Rehabilitation Report - 2023

Mount Thorley Warkworth

DOCUMENT CONTROL

Version	Date	Revision Description	Author	Approver
1.0	28/03/2024	ARR document prepared to satisfy new Standard Conditions on Mining Leases	Bill Baxter Environmental Specialist - Rehabilitation	Gary Mulhearn Environment & Community Manager

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DEFINITIONS / ABBREVIATIONS

- BBAM** - BioBanking Assessment Method
CCC – Community consultative Committee
CCL – Consolidated Coal Lease
CL – Coal Lease
EL – Exploration Licence
EPBC - Environment Protection and Biodiversity Conservation Act
EPA – NSW Environment and Protection Authority
EPL – Environment Protection Licence
ML – Mining Lease
MTO - Mount Thorley Operations
MTW - Mount Thorley Warkworth Coal Mine (combined operations)
RML - Radiation Management Licence
RMP – Rehabilitation Management Plan
ROBJ – Rehabilitation Objectives
TSF – Tailings Storage Facility
VENM - Virgin Excavated Natural Material
WML - Warkworth Mining Limited

Name of mine:	Mount Thorley Warkworth	
Annual Rehabilitation Report Period:	START DATE:	END DATE:
	1 January 2023	31 December 2023
Annual Rehabilitation Report revision dates and version numbers:	Version 1.0 - 28 March 2024	
Mining leases	No	Expiry
	CL 219	23 September 2044
	ML 1752	17 March 2038
	CCL 753	17 February 2034
	ML 1412	11 January 2038
	ML 1590	26 February 2028
	ML 1751	17 March 2038
	ML 1828	25 February 2043
Name of Lease holder(s)	Mt Thorley Operations Pty Ltd Warkworth Mining Limited Mount Thorley Coal Loading Ltd	
Date of Submission	28 MARCH 2024	

1.0 MINING DETAILS

1.1 PROJECT DESCRIPTION

Mount Thorley Warkworth (MTW) is an integrated operation of two open cut mines, Warkworth Mining Limited (WML) and Mount Thorley Operations (MTO), managed by Coal & Allied (NSW) Pty Ltd, a wholly owned subsidiary of Yancoal Australia Limited (Yancoal). MTW is located 14 km south west of Singleton in the Hunter Valley region of New South Wales.

Development Consent for the Warkworth Continuation Project (SSD-6464) and Mount Thorley Operations 2014 Project (SSD-6465) was granted on 26 November 2015. A modification to the Warkworth Continuation Project (SSD-6464 MOD2) was granted on 27 May 2022.

The Projects are described in detail in the Environmental Impact Statements and supporting documents (EMGA Mitchell McLennan, June 2014), and the Modification Report (SSD-6464 MOD 2, September 2021).

1.2 CURRENT DEVELOPMENT CONSENTS, LEASES, AND LICENCES

Environment Protection Licence (EPL): EPL 24, EPL 1976, EPL 1376.

Environment Protection and Biodiversity Conservation (EPBC) Act Approval: EPBC 2002/629, EPBC 2009/5081.

General Water Licences: WAL963, WAL10543, WAL18233, WAL18558, WAL19022, WAL39798, WAL40464, WAL40465, WAL43056, WAL43057, 20BL168821, 20BL171729, 20BL171841, 20BL171842, 20BL171843, 20BL171844, 20BL171845, 20BL171846, 20BL171847, 20BL171848, 20BL171849, 20BL171850, 20BL171891, 20BL171892, 20BL171893, 20BL171894, 20BL172272, 20BL172273, 20BL173065, 20BL173276.

Development Consents: SSD-6464, SSD-6465, DA 177/94.

Radiation Management License: RML 5061110, RML 5061122.

Prospecting and Coal Mining: CL 219, (Part) ML 1547 (Sublease), ML 1752, EL7712, EL 8824, CCL 753, ML 1412, ML1590, ML 1751, ML 1828.

Store Explosives License: XSTR100160.

In 2023, a change to EPL 1976 (Mount Thorley) was approved to: 1) change the premises boundary to allow emplacement of overburden across the mining lease boundary to construct the approved final landform; 2) include the Scheduled Activity: Crushing, Grinding, or Separating which occurs at MTO; 3) update the Waste section to generally align the EPL conditions with the Warkworth Coal Mine Premises for which EPL 1376 is held; 4) refer to a new datum – GDA2020 MGA Zone 56 and update all coordinates noted in EPL 1976 accordingly; and 5) remove the requirement to monitor blast overpressure at Point 5 (Warkworth Village) as there are no residences on privately owned land at this location.

1.3 LAND OWNERSHIP AND LAND USE

There was no change to land ownership for MTW in the reporting period.

2.0 COMPLAINTS

No complaints related to rehabilitation received in 2023.

3.0 STAKEHOLDER CONSULTATION

Table 1: Stakeholder Consultation 2023

Date	Stakeholder	Consultation Forms	Matters	Actions
February 2023	Community Consultative Committee (CCC)	CCC Meeting	Rehabilitation and disturbance forecasts for 2023	No actions required
May 2023	Community Consultative Committee	CCC Meeting	YTD progress against rehabilitation and disturbance targets for 2023. Final landform and drainage from FLRP	No actions required
May 2023	NSW Environment Protection Authority (EPA)	HRSTS Operations Committee Meeting	Request for review of saline water definition to allow runoff from stabilised rehabilitation catchments to be discharged off site outside of the HRSTS scheme.	To be considered by EPA in HRSTS Regulation review
August 2023	Community Consultative Committee	CCC Meeting	YTD progress against rehabilitation and disturbance targets for 2023. EPL Variation (approved June 2023) to allow emplacement of overburden across the Bulga Coal Operations mining lease boundary	No actions required
November 2023	Community Consultative Committee	CCC Meeting	YTD progress against rehabilitation and disturbance targets for 2023. EPL variation submitted November 2023 due to cross mining lease overburden emplacement completed.	No actions required

4.0 SURFACE DISTURBANCE AND REHABILITATION ACTIVITIES

Surface disturbance activities included:

- Progression of mining in North Pit and West Pit areas, including associated water management infrastructure (98.4ha)
- Rehabilitation disturbance in South Pit to allow construction of approved final landform (7.9ha)
- Construction of light vehicle access in South Pit to improve light vehicle/heavy vehicle interaction (0.2ha)

The disturbance in this reporting period was 106.5ha. The disturbance ahead of mining conducted in 2023 was forecast in the Forward Program apart from approximately 7.6ha of additional disturbance in West Pit associated with water management infrastructure ahead of mining.

Rehabilitation activities included:

- Rehabilitation of overburden emplacements in North Pit (18.4ha), Centre Dump (CD) (32.9ha), Mount Thorley (32.8ha) and South Pit (0.7ha).
- Rehabilitation of Tailings Dam 1 (6.6ha)
- Rehabilitation of topsoil stockpile bases after use of stockpile material in North Pit (0.3ha) and Mount Thorley (1.9ha).
- Topsoil was not used on some rehabilitation areas in CD (3.7ha). Mine spoil ameliorated with compost (100t/ha) and gypsum (10t/ha) was used as the growth medium.

The rehabilitation (Ecosystem and Land Use Establishment) undertaken in this reporting period was 93.6ha. The bulk of the rehabilitation completed in the reporting period was in North Pit, CD and Mount Thorley.

Progressive rehabilitation commitments are outlined in the Warkworth Continuation 2014 and Mt Thorley Operations 2014 Environmental Impact Statements. These documents modelled a total of 1,607.8 ha of rehabilitation to be completed by the end of 2023. At the end of the reporting period there had been 1,383.1 hectares of rehabilitation completed across Warkworth and Mount Thorley, 224.7ha behind the EIS forecast for the end of 2023.

Rehabilitation Planning Activities

The MTW final landform design was updated for submission of the Final Landform and Rehabilitation Plan in August 2023. The final landform of MTW has been designed using a geomorphological landform design approach based on alluvial analogues. The landform design work was undertaken using an external specialist consultant (WSP Australia) and an erosional risk analysis has been conducted to determine areas that require rock lining for erosion protection.

The landform design work included the sizing and positioning of a temporary stockpile of capping material for the Lodgers Pit Tailings Storage Facility (TSF). The Lodgers Pit TSF will be used for tailings deposition through to the closure of MTW. Sufficient material will be needed to be stockpiled adjacent to this facility during the operational phase of the mine to facilitate capping at closure. Further studies will be

undertaken to reduce the amount of capping material required to be stockpiled by potentially reducing the footprint of the TSF.

Surface soils from 10ha of stripping area ahead of mining in North Pit were assessed and classified in accordance with the NSW EPA requirements for classifying excavated materials as Virgin Excavated Natural Material (VENM). The stripped soil is proposed for off-site re-use in revegetation activities at MTW's Northern Biodiversity Area.

Subsidence Repair Undertaken

As MTW is an open cut operation, subsidence has been regarded as a negligible risk. Regardless, mine subsidence was examined and risk-ranked in the Rehabilitation Management Plan (RMP) Risk Assessment. No subsidence incidents have been recorded at MTW. As such this RMP does not introduce measures and methods to address subsidence impacts to rehabilitation during the active phase of mining.

Rehabilitation Management and Maintenance Activities

The following weed management activities were conducted across rehabilitation areas at MTW:

- Boom spraying of various exotic grasses and broadleaf weeds (14.7ha);
- Weed wiping of *Acacia saligna* shrubs and various exotic grasses (18.2ha);
- Selective spraying (backpack) of various exotic grasses and broadleaf weeds (164.4ha); and
- Manual removal (Cut and Paint) of *Acacia saligna* shrubs (92.9ha)

Rehabilitation areas with poor germination results (12.8ha) were re-spread with soil ameliorants and re-seeded with native seed mixes. Areas affected by erosion (0.8ha) had repair work undertaken and were re-seeded with native seed mixes. Coir logs were installed in rehabilitation areas in North Pit to assist with temporary stabilisation of slopes. Silt was cleaned out using a small excavator from coir logs in Centre Dump rehabilitation area.

Two 1080 ground baiting programmes utilising meat baits and ejector baits were undertaken during autumn and spring to target wild dogs and foxes. The program consisted of approximately 60 bait sites across MTW, including rehabilitation areas.

A feral pig trapping programme was carried out across MTW in winter that resulted in 27 feral pigs being controlled.

Rehabilitation Actions

Resubmission of updated Rehabilitation Objectives and Final Landform Rehabilitation Plan spatial data in August 2023. Request from Resources Regulator for further information for applications ROBJ0001178 and FLRP0001145.

Design of temporary capping material stockpile for Loders Pit TSF undertaken as part of final landform design work. Further investigations to be undertaken during 2024 reduce the amount of capping material required for the closure of the Loders Pit TSF. Recommendation from Targeted Assessment Program – Landform Establishment (May 2021).

Initial meeting undertaken with external consultancy firm and provision of high resolution scan data and lower resolution Lidar data for the assessment of the long-term stability of the final landform using

Landform Evolution Models. Recommendation from Targeted Assessment Program – Landform Establishment (May 2021).

Importation of rock for use on rock-lined drains in Geofluv landform areas Targeted Assessment Program – Landform Establishment (May 2021).

Rehabilitation Areas That Have Achieved the Final Land Use

No areas achieved final land use during the 2023 reporting period.

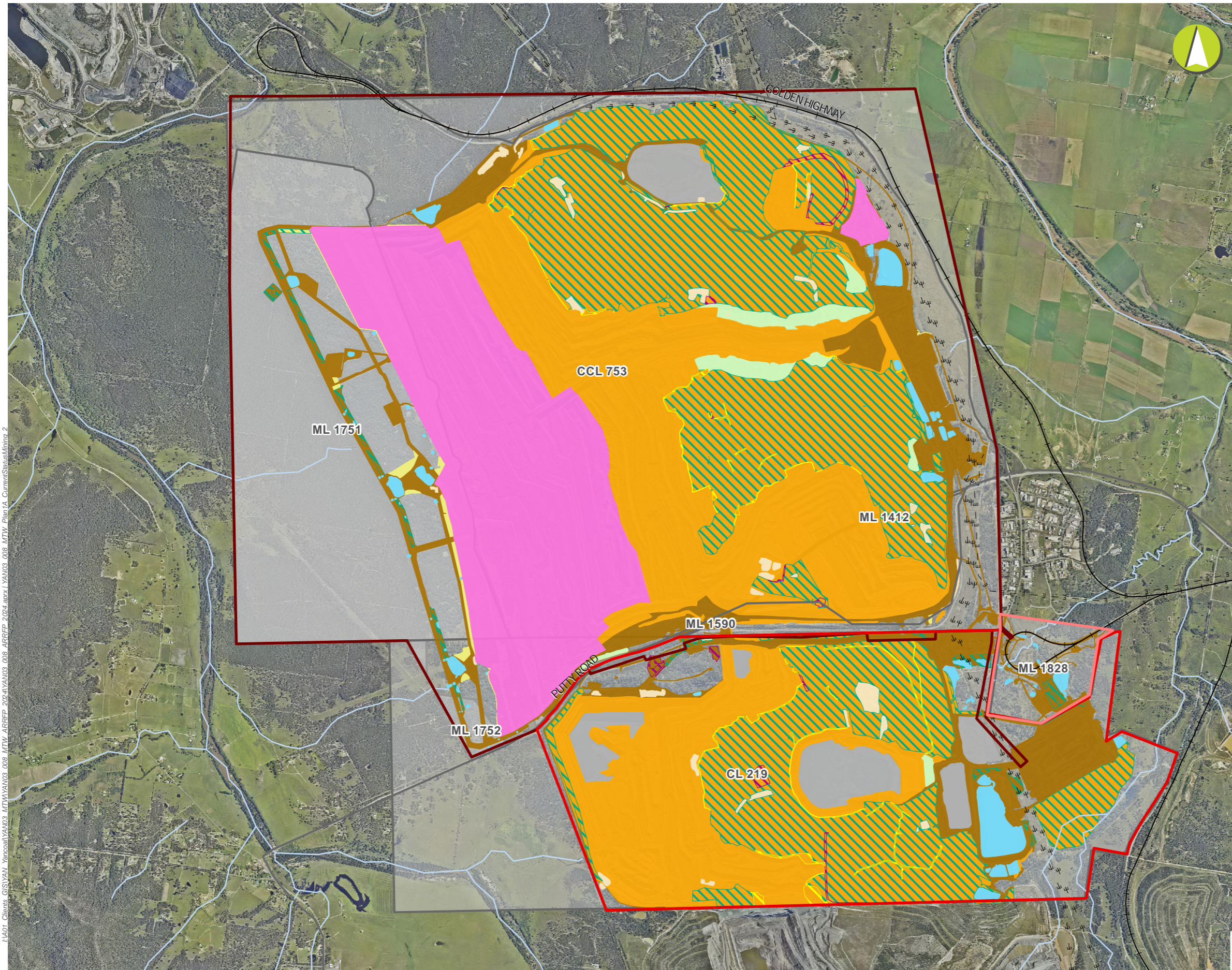
Key Production Milestones

Table 2: Key Production Milestones Calendar Year 2023

Material	Unit	Year 1 2023 Forward Program	This report
Stripped topsoil	m3	90,683	106,500
Rock / Overburden	m3	113,846,797	112,161,283
Ore	Mt	20.35	17.23
Reject Material (Includes coarse rejects, tailings and any other wastes resulting from beneficiation)	Mt	5.2	5.76
Product	Mt	11.22	11.26

Figure 1: Plan 1A - Current Status of Mining and Rehabilitation

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0 475 950 1,425 1,900
 Scale: 1:40,000

LEGEND

- Project Approval Number
- SSD 6464 - Warkworth
- SSD 6465 - Mount Thorley
- ML 1828 - Mount Thorley Coal Loader
- Railway
- Major Road
- Waterways
- Electricity Transmission Line
- Current Authorisations
- Relevant Mining Title
- Rehabilitation Phase
- Landform Establishment
- Growth Media Development
- Ecosystem and Land Use Establishment
- Mining Domain Type
- Domain 1: Infrastructure Area
- Domain 2: Tailings Storage Facility
- Domain 3: Water Management Area
- Domain 4: Overburden Emplacement Area
- Domain 5: Active Mining Area (Open cut void)
- Domain 8a: Other - Topsoil Stockpile
- Domain 8b: Other - Topsoil Stripped
- Domain 8c: Other - Temporary Rehabilitation

Mount Thorley Warkworth Complex

Current Status Mining and Rehabilitation PLAN 1A

Mine name	Mount Thorley Warkworth Complex
Plan name	Mount Thorley Warkworth ARR
Year of anticipated relinquishment	To be determined closer to closure
Data theme submission ID No.	7703 & 7698
Spatial Reference	GDA2020 MGA Zone 56
Plan date (date created)	12/04/2024

Figure 2: Plan 1B - Current Landform Contours

Disturbance and Rehabilitation Statistics

Table 3: Current Disturbance and Rehabilitation Progression Calendar Year 2023

	Annual Reporting Period	This report
A	Total disturbance footprint – surface disturbance	4165.76
B	Total active disturbance (Ha)	2746.52
C	Rehabilitation – land preparation (Ha)	37.97
D	Ecosystem and land use establishment (Ha)	1381.28
E	Ecosystem and land use development (Ha)	0
F	Rehabilitation completion (Ha)	0

Table 4: Rehabilitation key Performance Indicators (KPI's) Calendar Year 2023

	Annual Reporting Period	This report
G	Total active disturbance during reporting period (Ha)	106.5
H	Area of land proposed for active rehabilitation during reporting period (Ha)	93.6
I	Established rehabilitation (Ha)	0
J	Annual rehabilitation to disturbance ratio	0.88
K	Ecosystem and land use development (Ha) % Rehabilitation land to total mine footprint	0

Table 5: Progressive Achievement of Established Rehabilitation Calendar Year 2023

	Annual Reporting Period	This report
L	Established rehabilitation for agricultural final land uses (%)	0
M	Established rehabilitation for native ecosystem final land uses (%)	0
N	Established rehabilitation for other/ non-vegetated final land uses (%)	0

4.1 VARIATION TO THE REHABILITATION SCHEDULE

Identify the components of the most recent forward program that were not achieved.

The rehabilitation forecast in the 2023 Forward Program was 90.01ha and the amount of rehabilitation (Ecosystem and Land Use Establishment) undertaken during the reporting period was 93.6ha.

The disturbance forecast in the 2023 Forward Program was 90.68ha and the amount of disturbance undertaken during the reporting period was 106.5ha.

The quantity and location of rehabilitation and disturbance was generally consistent with the Forward Program projections.

Key factors that have delayed the progressive rehabilitation.

None required.

Outline actions to minimise disturbance and undertake progressive rehabilitation.

Dump scheduling has been undertaken by Medium Term Planning team to identify the timing of dump releases for the Forward Program period. Carryover of dump release and bulk shaped areas is planned each year to provide rehabilitation crews with consistent work through the year.

New disturbance is planned by Medium Term Planning team to minimise disturbance while supporting mine progression.

5.0 REHABILITATION MONITORING AND RESEARCH FINDINGS

5.1 REHABILITATION MONITORING

No rehabilitation monitoring was conducted during 2023 due to due to Rehabilitation Objectives (ROBJ's) for MTW awaiting approval. The MTW ROBJ's were approved by Resources Regulator in December 2023 and this prompted the preparation of an updated RMP to incorporate the approved ROBJ's. The proposed Performance Criteria associated with these ROBJ's were also included in the updated RMP and these will form the basis of the rehabilitation monitoring that will be undertaken in 2024.

A total of 76 rehabilitation inspections were undertaken during 2023 to determine maintenance requirements related to vegetation establishment, weed management, water management and other management (i.e. disturbance, rubbish, vertebrate pest management etc.). These inspections were used to guide rehabilitation maintenance activities undertaken during 2023.

5.2 STATUS OF PERFORMANCE AGAINST REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

Previous monitoring methods incorporated and addressed the requirements specified in MTW RMP (2022). This included: a combination of plot-based monitoring in accordance with the NSW BioBanking Assessment Method (BBAM) (to assess native vegetation) together with walkover inspections of

rehabilitation areas to detect potential issues occurring at the broader scale; Landscape Functional Analysis; soil assessment (chemical/nutrition and microbial); and native canopy development.

Are all rehabilitation areas in the Landform Establishment phase or higher represented in the monitoring program

Yes

Include an appraisal of whether rehabilitation is moving towards achieving the proposed rehabilitation objectives, rehabilitation completion criteria and final landform and rehabilitation plan

Ecological monitoring reports from 2022 indicate that recent rehabilitation at the Northern area at MTW is progressing towards the target vegetation communities, with no evidence of disease or die-back recorded. Species richness was recorded as moderate to low in the Central rehabilitation area, with MTW to increase rehabilitation efforts in this area to achieve the target vegetation communities required.

Most of the Southern area provided moderate to high native species richness with one site exceeding the benchmark value providing evidence of good potential resilience through a diversity of native species and good native ground cover. One site provided the lowest native species richness score, due to the area being established within 12 months. This site is likely to improve over time with appropriate weed control. The canopy cover was low at all sites which is expected in early-stage rehabilitation.

A total of 229 plant species were recorded across all monitoring sites in 2022, including 175 native species and 54 weed species. The most speciose family was Poaceae (grasses) with 53 species recorded, followed by Fabaceae (including subf. Faboideae (peaflowers) and subf. Mimosoideae (wattles)) with 33 species and Asteraceae with 31 species.

Please select the best description of the appraisal

Regulator Portal Options	MTW Selection
Rehabilitation is moving towards achieving the final land use as soon as reasonably practicable.	
There are performance issues preventing rehabilitation moving towards achieving the final land use as soon as reasonably practicable.	X

Summarise the findings of the Rehabilitation Monitoring Program,

A total of 43 flora monitoring sites were assessed between the Northern, Central and Southern Rehabilitation Areas. The rehabilitation sites in the northern area generally provided evidence of good resilience through high diversity of native species and good native ground cover in many of the areas surveyed. This is a good indicator of the ability of the sites monitored in 2022 to progress towards the target vegetation community.

The central area provided moderate native ground cover (grasses, shrubs and other) for most sites. This shows good potential resilience following control of invasive grass species.

All sites provided poor native canopy cover; however, tree species were recorded between two and seven species at each plot. This indicates that a canopy is likely to establish over time at most sites. The mid-layer (shrubs) are developing in the southern area with seven sites achieving a higher shrub cover than the average of the reference sites. The shrub layer cover is likely to improve over time with appropriate weed control.

Based on collected monitoring results and observations, management recommendations have been suggested to improve the condition of rehabilitation areas and ensure they are trending towards the defined final land use objectives.

Identify any performance issues

The rehabilitation monitoring report (2022) outlines the following:

- Appropriate weed management of invasive grassland species and appropriate cover in shrub and canopy layer will allow site to progress towards target vegetation community;
- High Threat Exotic (HTE) weed species pose a significant threat to the development of the target vegetation community.
- Thinning should be undertaken surrounding NPN202001 due to the dense cover of spotted gum.
- Create a fallen timber corridor through the rehabilitation areas, this will provide refuge and potential habitat for mammals, reptiles, and frogs across the rehabilitation area.
- Review the seed mix used to ensure that appropriate species and rates are being applied to new rehabilitation area.

5.3 OUTCOMES OF REHABILITATION RESEARCH AND TRIALS

Table 6: List of Active Rehabilitation Research and Trials

No.	Project/Trial Name	Objective of Trial Project	Methodology	Expected Date of Completion
2	Compost Type Trial (Spoil/Compost Application)	Rehabilitation trials to test if different types of compost result in improved native vegetation establishment in spoil/compost applications	Application of 3 types of compost: Remondis (coarse), Remondis (with fines), Bettergrow (with Biosolids) to a rehabilitation area with mine spoil as growth medium. Trial areas seeded with diverse native seed mix and monitored to detect differences in native vegetation establishment.	30/06/2024

Table 7: List of Inactive Rehabilitation Research and Trials

No.	Project/Trial Name	Objective of Trial Project	Methodology	Expected Date of Completion
1	Bursaria spinosa Germination trial	Germination testing: 1) if freezing pre-treatment of seed improves germination rates; and 2) if germination rates in MTW topsoil's and spoils are comparable to seed raising mix.	Subject seed to freezing temps pre-treatment and run a germination trial with the following treatments: Provenance 1(Hunter Valley) control/seed raising mix; Prov. 1 freeze treatment/seed raising mix; Prov. 1 freeze treatment/typical MTW topsoil; Prov. 1 freeze treatment/typical MTW spoil/ameliorant. Provenance 2(Coonabarabran) control/seed raising mix; Prov. 2 freeze treatment/seed raising mix; Prov 2 freeze treatment/typical MTW topsoil; Prov. 2 freeze treatment/typical MTW spoil/ameliorant.	30/11/2023