CENTENNIAL

CENTENNIAL COAL
Myuna Colliery
2024 ANNUAL REVIEW

March 2025

Annual Review Title Block

Name of Operation	Myuna Colliery
Name of Operator	Centennial Myuna Pty. Limited
Development Consent/ Project Approval #	PA10_0080 SH110-148
Name of holder of Development Consent/ Project Approval	Centennial Myuna Pty. Limited
Mining Lease #	ML1632, ML1370, ML1880 and MPL344, EL4444 and EL6640
Name of Holder of Mining Lease	Centennial Myuna Pty. Limited
Water License #	WAL 41560
Name of Holder of Water License	Centennial Fassifern Pty. Limited
RMP Start Date	1 August 2022
RMP End Date	N/A
Annual Review Start Date	1 January 2024
Annual Review End Date	31 December 2024

I, Terry O'Brien certify that this audit report is a true and accurate record of the compliance status of Centennial Myuna for the period 1 January to 31 December 2024 and that I am authorised to make this statement on behalf of Centennial Myuna.

Note:

a) *The Annual Review is an 'environmental audit' for the purposes of s122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion) in an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

b) *The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (intention to defraud by false or misleading statement – maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents –maximum penalty 2 years imprisonment or $22,000,or both).*

Name of Authorised Reporting Officer	TERRY OBRIEN
Title of Authorised Reporting Officer	MINE MANAGER
Signature of Authorised Reporting Officer	*(signature)*
Date	31/03/25

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Plan Reference	Plan Name
MY11606	Annual Review Plan 204
FASS102070	Myuna Colliery Environmental Protection Licence No.366 Premises Boundary and Monitoring Points
MY11301	Myuna Colliery Surface Layout
Extraction Plan 1121,1123 – (Figure 4.1)	Seagrass and Benthic Community Monitoring Locations

1 STATEMENT OF COMPLIANCE

The compliance status of Myuna Colliery in 2024 is provided in **Table 1-1** below. There was one non-compliances during the reporting period.

Non-compliances applicable to the Reporting Period are summarised in **Table 1-2.**

Table 1-1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Project Approval 10_0080 (MOD3)	No
Development consent SH110/148	Yes
Mining Lease 1632	Yes
Mining Lease 1370	Yes
Mining Lease 1880	Yes
Mining Purposes Lease 334	Yes
Exploration Licence 4444	Yes
Exploration Licence 6640	Yes
Exploration Licence 9625	Yes
EPL 366	No
WAL 41560	Yes
Section 151 Point Wolstoncroft SCA	Yes
Section 151 Pulbah Island SCA	Yes
Section 151 Wangi Point SCA	Yes

Table 1-2: 2024 non-Compliances

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Where Addressed in Annual Review
PA10-0080 EPL366	Schedule 3 Condition 19 M2.2	Implement an Air Quality & Greenhouse Gas Management Plan Air Monitoring Requirements – Particulates - Deposited Dust	Non-Compliant	On 1 November 2024 the depositional dust gauge DG1 for the monitoring period 2 October 2024 to 1 November 2024 was unable to be analysed as the glass container for the dust gauge was unable to be located.	**Section 11.**

Note: Compliance Status Key for Table 1-2

Risk Level	Colour Code	Description
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-Compliant	Non-compliance with: • Potential for serious environmental consequences, but is unlikely to occur; or • Potential for moderate environmental consequences, but is likely to occur
Low	Non-Compliant	Non-compliance with: • Potential for moderate environmental consequences, but is unlikely to occur; or • Potential for low environmental consequences, but is likely to occur
Administrative	Non-Compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2 INTRODUCTION

Myuna Colliery (Myuna) is an underground coal mine owned and operated by Centennial Myuna Pty Limited (Centennial Myuna). Myuna is located 25 km southwest of Newcastle NSW in the Lake Macquarie and Wyong Local Government Areas. The Colliery lease lies within the Parishes of Awaba, Coorumbung, Morisset and Wallarah in the County of Northumberland subsidence district and is located within the Shire of Lake Macquarie.

Lake Macquarie City Council (LMCC) granted Development Consent SH110_148 for the development and operation of the Myuna and Cooranbong Collieries in 1977. The Development Consent was granted pursuant to the provisions of the now repealed Local Government Act 1919. The Development Consent remains in force and authorises the extraction of coal within the Development Consent Mining Area.

The Development of Myuna began in 1979 and underground mining using bord and pillar mining methods commenced in 1982. Centennial Coal Company Limited acquired Myuna in 2002 and has operated the mine since that time.

On 18 January 2012, the then Minister of Planning and Infrastructure granted Project Approval PA 10_0080 to Centennial Myuna. PA 10_0080 authorises the continued mining in areas outside the existing Development Consent SH110_148 mining area and within the boundary of existing mining leases held by Centennial Myuna. PA 10_0080 authorises:

- the use of bord and pillar methods in the Wallarah, Great Northern and Fassifern coal seams;
- produce, handle and distribute to Eraring Power Station, up to 2 Mtpa using existing infrastructure; and
- the continued use of ancillary infrastructure until 31 December 2032.

Modification (MOD 1) to PA10_0080 was approved on 1 February 2015. MOD 1 included;

- an increase in run of mine (ROM) coal extraction to up to 3 million tonnes per annum; and
- an increase in employment to up to 300 full time employees.

Modification 2 (MOD 2) was related to road transport and was later withdrawn. Modification (MOD 3) was approved on 25 November 2022. This was an administrative change to the rehabilitation conditions to ensure consistency between the project approval and the mining leases following the rehabilitation reforms.

Figure 2-1 Figure 2-1: Regional Context shows;

- the operation and its regional context,
- Development Consent SH110_148 and Project Approval 10_0080 boundaries,
- mining lease boundaries, and
- current operational disturbance footprint.

2.1 SCOPE

This Annual Review (AR) details the compliance and environmental management performance of Myuna over the Period 1 January 2024 to 31 December 2024 (reporting period). The AR has been prepared in accordance with the *Annual Review Guideline* (DPIE 2015), and satisfies:

- Schedule 5, Condition 4 of PA10_0080
- Reporting requirements of Extraction Plan for Panels 1121 and 1123.

2.2 MINE CONTACTS

The contact details for the personnel responsible for environmental management and community relations at Myuna are provided in **Table 2-1** below.

Table 2-1: Centennial Site Environmental Contact Details

Name	Position	Contact Details
Terry O'Brien	Mine Engineering Manager	02 4935 8988
		Terry.obrien@centennialcoal.com.au
Kieran Fiatarone	Environment & Community Coordinator	02 4970 0263
		Kieran.j.fiatarone@centennialcoal.com.au
Community Information and Complaints Line		02 4970 0270

New South Wales - Australia
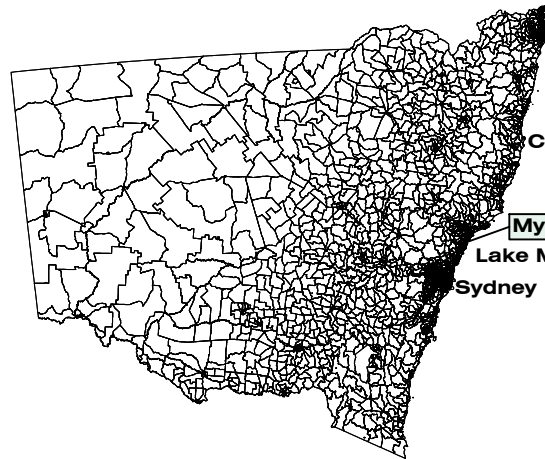
Crescent Head

Myuna Colliery

Lake Macquarie

Sydney

N

ML1632

MT Two
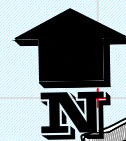
Lake Macquarie

MPL 334

ML 1632

Wangi Wangi

Swansea

Pulbah Island

DORA CREEK

ML1632

Morisset Peninsula

Point Wolstoncroft

ML1632

N

0   0.5   1.0   1.5   2.0
Kilometres

LEGEND
MOP Area - Colliery Holding Boundary
Mining Leases
Cadastral Boundary
Roads
Water features
Lake Macquarie
Part 3A - Project Approval Area
Development Consent SH 110/148

Wallarah seam workings (December 2024)
Great Northern seam workings (December 2024)
Fassifern seam workings (December 2024)

Myuna Colliery Overview

Scale: 1:150,000

Refer Main Map

Legend

- **EPL366 Premises Boundary**
- **Myuna Colliery Holding**

Monitoring Locations (EPA Description)

- Discharge to waters, Discharge quality monitoring
- Discharge to waters, Discharge quality monitoring, Volume monitoring
- Dust deposition gauge
- Manganese monitoring
- Meteorological Station
- Noise monitoring
- Particulate matter - PM10 - High Volume Air Sampler

EPL Monitoring Locations

EPA Ref	Site Name	Easting	Northing
3	DG1	366672	6340920
5	DG3	366669	6340351
6	DG4	366020	6340756
8	HVAS_PM10	366341	6340861
9	LDP_9	366437	6340897
10	LDP_10	366407	6341145
11	R1	366858	6340371
13	R3	365707	6340845
15	R5	366856	6341339
17	R7	367075	6340971
20	AWS	366341	6340861
	T2-5M	367546	6340523
	T2-10M	367583	6340520

Drawn	D.MacBain
Checked	V.Howat
Approved	K.Fiatarone
Scale	1:8,000 @ A3
Revision	2

Coordinate System: GDA2020 MGA Zone 56

**Myuna Colliery
Environment Protection
Licence No.366 (EPL366)
Premises Boundary and
Monitoring Points**

CENTENNIAL MYUNA

Date: 26/11/2024   Plan No. FASS10270

3 APPROVALS

3.1 PROJECT APPROVALS, MINING AUTHORISATIONS, AND OTHER LICENCES

A summary of Project Approvals, Mining Authorisations, and other Licences relevant to Centennial Myuna is provided in **Table 3-1**. Current Project Approvals, EPBC Approvals, Exploration Licences, and Mining Leases are available at the Myuna website.[1]

Table 3-1: Environmental Approvals held by Centennial Myuna

Approval	Description	Expiry Date	Change to Approval during the Reporting Period
Project Approval			
PA10_0080 (MOD 3)	Project Approval	December 2032	Nil
SH110-148	Development Consent for Myuna Colliery	N/A	Nil
Mining Leases			
ML 1632	Mining Lease	31/10/2043	Nil
ML 1370		07/03/2033	Nil
ML 1880		01/08/2045	ML1880 was granted on 1 August 2024.
Mining Purpose Leases			
MPL334	Mining Purposes Lease for Myuna Colliery	20/10/20236	Nil
Exploration Authorisations			
EL4444	Exploration Licence	23/10/2026	Nil
EL6640		23/04/2026	Nil
EL9625		15/12/2029	Yes - Relinquished
Rehabilitation Management Documents			
RMP	Myuna Colliery Rehabilitation Management Plan	N/A	Nil
Environmental Protection Licence			
EPL366	Environmental Protection Licence for Myuna Colliery	Renewed Annually	Nil
Water Licences			
WAL41560	Water Access Licence	Perpetuity	Nil
20BL1732259	Groundwater monitoring bores	Perpetuity	Nil
Radiation Management Licence			
RML 5094930	Fixed Radiation Gauge	Renewed Annually	Nil
Mining Operations Licences			

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[1] www.centennialcoal.com.au/operations/myuna

Approval	Description	Expiry Date	Change to Approval during the Reporting Period
Section 151 Licence	Pulbah Island	31/10/2021	Nil
	Pt Wolstoncroft	10/09/2025	Nil
	Wangi Point	10/09/2027	Renewed

3.2 EXTRACTION PLAN STATUS

The Myuna Extraction Plan for Panels 1121 and 1123 within the Fassifern Seam was submitted to the Department of Planning, Housing and Infrastructure (DPHI) on 26 August 2024 and subsequently approved on the 11 October 2024. Extraction at Myuna is limited entirely to Zone B as defined by PA10_0080. Secondary extraction of the 1121 Panel was completed as of late 2024, with the 1123 panel to be subject to secondary extraction in mid-2025.

3.3 ANNUAL REPORTING REQUIREMENTS

Appendix 1 provides a checklist of reporting requirements and performance conditions addressed within the Annual Review.

In accordance with the requirements of PA10_0080 MOD 3 (Schedule 5 Condition 4 - Annual Review) and the conditions outlined in **Appendix 1**, the 2024 Annual Review will be provided to the DPHI and the Myuna CCC and made available on the Myuna website.[1]

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[1] www.centennialcoal.com.au/operations/myuna

4 OPERATIONS SUMMARY

4.1 PRODUCTION

Details of production and associated waste generated by Myuna for the report period and next reporting is provided in **Table 4-1,** as is the operations and coal processing, handling and transport relevant to Myuna.

There were no inconsistencies between the approved limits and actual production for the reporting period.

Table 4-1: Production Summary & Forecast

Material	Approved Limit	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Waste Rock / Overburden	N/A	N/A	N/A	N/A
ROM Coal	3,000,000	1,097,573	903,667	1,245,634
Coarse reject	N/A	N/A	N/A	N/A
Fine reject (tailings)	N/A	N/A	N/A	N/A
Saleable Product	3,000,000	1,097,573	903,667	1,245,634

4.2 MINING OPERATIONS

All production miners were operating in the Fassifern Seam during the reporting period.

Two continuous miners were operating as a dual miner panel in the Fassifern North area under the Myuna Herringbone System (first workings bord and pillar).

Two continuous miners were operating in the Fassifern South as first workings bord and pillar (either Myuna Herringbone System or development roadways for secondary extraction). One of the continuous miners in the Fassifern South in Q4 of 2024 also completed some secondary extraction (partial pillar extraction in 1121 Panel).

4.3 EXPLORATION

Exploration was completed in the most northern portion of the consent boundary and within the new mining lease area (ML1880). The purpose of the investigation was to determine rockhead cover (minimum 40m requirement) and to identify geological features within the coal seam. This was completed in October 2024 using a low impact non-intrusive geophysical method. There were no safety or environmental issues associated with the exploration program.

4.4 LAND DISTURBANCE

There has been no land disturbance at Myuna during the 2024 reporting period.

4.5   CONSTRUCTION

There has been no construction at Myuna during the 2024 reporting period.

4.6   NEXT REPORTING PERIOD

Planned production for the next reporting period is as follows:
- Two continuous miners operating in the Fassifern North region as a dual miner panel (Myuna Herringbone System) as per the 2024 reporting period.
- Two continuous miners operating in the Fassifern South. This will be a combination of development roadways, herringbone first workings and secondary extraction. Secondary extraction (partial pillar extraction in 1123 Panel) is scheduled for the second half of 2025.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Table 5-1 below summarises the outcomes of the 2024 Annual Review, including any actions issued by Regulators and actions outlined by Myuna in the 2023 Annual Review.

A letter was received from DPHI dated 27 June 2024 stating the Annual Review for the period 1 January 2023 to 31 December 2023 satisfied the reporting requirements of PA10_0080. No further action or information was requested.

Table 5-1: Actions from Previous Annual Review

Action Required	Requested By	Action Taken	Where addressed in Annual Review
Ongoing implementation of strategies contained in Myuna's approved Management Plans to manage the risks associated with the operation.	2023 AR	Management Plan implementation is detailed in this AR	**Sections 6, 7, and 8**
Review and revision of Management Plans as per approval (PA 10_0080) conditions.	2023 AR	Management Plans reviewed. Letter sent to DPHI on 15/07/2024	NA
Independent Environmental Audit Action Plan	2023 AR	Update provided in this AR	**Section 10**

6 ENVIRONMENTAL PERFORMANCE

Myuna implements an Environmental Management Strategy (EMS) as per Schedule 5 Condition 1 of PA10_0080, including management plans, procedures and monitoring programs that provide a framework for managing environment and community risks and impacts. To measure compliance with site approvals and licences, Myuna undertakes a comprehensive monitoring program, which is shown the **Table 6-1** below and in **Figure 6-1** on the following page.

Table 6-1: Summary of Monitoring Requirements

Monitoring Type	Overview of Monitoring Requirements	Requirement of Approval / Management Plan	Where Addressed in Annual Review
Meteorological	Temperature, wind speed, humidity, rainfall, sigma-theta	Northern Region Air Quality & Greenhouse Gas Management Plan EPL 366	**Section 6.1**
Noise	Quarterly at 4 locations	Northern Region Noise Management Plan EPL 366	**Section 6.2**
Air quality	3 x DGs - Monthly 1 x HVAS – every 6 days	Northern Region Air Quality & Greenhouse Gas Management Plan EPL 366	**Section 6.3**
Greenhouse Gas	Monthly gas bag sample	Northern Region Air Quality & Greenhouse Gas Management Plan	**Section 6.4**
Biodiversity	Annual surveys at 3 locations	Biodiversity Management Plan	**Section 6.5**
Heritage	As required	Northern Region Aboriginal Cultural Heritage Management Plan Northern Region Historic Heritage Management Plan	**Section 6.6**
Mine Subsidence	Bathymetric Survey	Secondary Extraction Plan 1121, 1123	**Section 6.7**
Waste	No formal requirement	EPL 366	**Section 6.8.1**
Water	Surface Water Volume & Quality - Various Groundwater Depth	Water Management Plan EPL 366	**Section 7**
Rehabilitation	N/A	Rehabilitation Management Plan Rehabilitation Strategy	**Section 8**

N

METRES
0 100 200 300 400 500

N 6 341 500

N 6 341 000

N 6 340 500

N 6 340 000

E 365 500
E 366 000
E 366 500
E 367 000
E 367 500
E 368 000

Upstream

R5

MPL 334

LDP 10
Stockpile Dam

ML 1632

DG1
Downstream
R7

LDP 9
MYSGN2
Weather Station
Ground Water Discharge point

R3

DG4
Waste Area

DG3
R1

Lake Macquarie

Vangi Power Station

T2
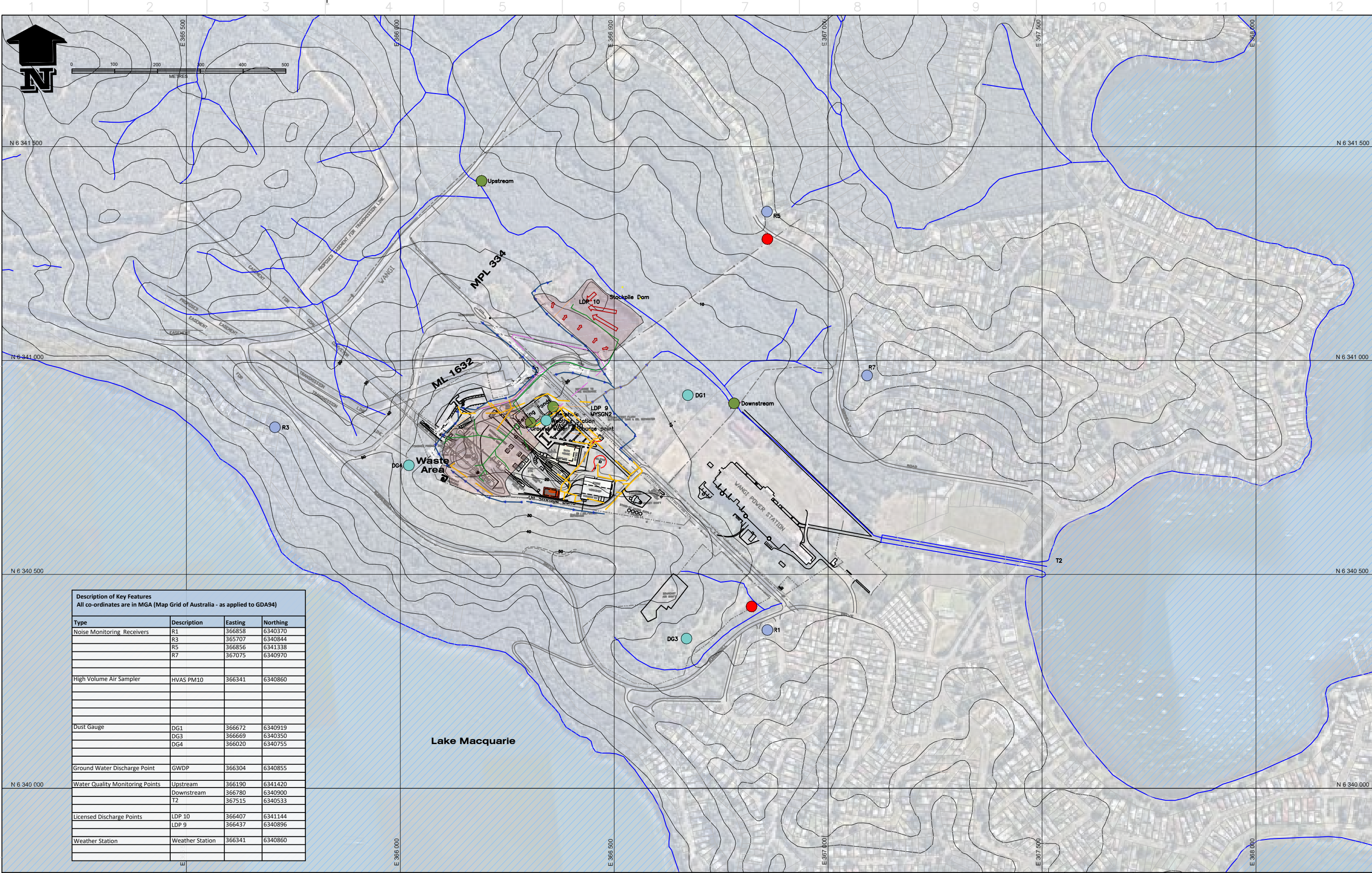
Description of Key Features
All co-ordinates are in MGA (Map Grid of Australia - as applied to GDA94)

Type	Description	Easting	Northing
Noise Monitoring Receivers	R1	366858	6340370
	R3	365707	6340844
	R5	366856	6341338
	R7	367075	6340970
High Volume Air Sampler	HVAS PM10	366341	6340860
Dust Gauge	DG1	366672	6340919
	DG3	366669	6340350
	DG4	366020	6340755
Ground Water Discharge Point	GWDP	366304	6340855
Water Quality Monitoring Points	Upstream	366190	6341420
	Downstream	366780	6340900
	T2	367515	6340533
Licensed Discharge Points	LDP 10	366407	6341144
	LDP 9	366437	6340896
Weather Station	Weather Station	366341	6340860

LEGEND

Holding Boundary
Mining Leases
Part 3A Approval area
Cadastral Boundary
Roads
Water features

10m Contours
Dirty water pit and pipe network
Clean water diversions
Storm water pipe network
Water sprays

Surface Water Bodies
Oil Storage Bund
Dirty Water Catchment area
Surface Ventilation systems

★ Licensed Discharge Points
● Water Monitoring points
● Noise Logger location
◉ Noise Monitoring Receivers
◉ Dust Gauge
★ Weather station

◎ Borehole
◉ Ground Water Discharge Point

Endorsement: The Cadastral information shown on this plan has been provided by LPI in 2012. The locations of the Key Features shown – such as noise receivers and water monitoring points have been provided by AECOM and were used in the preparation of the "Myuna Colliery extension of mining – Environmental Assessment"

Note: All co-ordinates are in MGA (Map Grid of Australia – as applied to GDA94)

DRAWN :	DH
DATE :	04.09.2014
CHECKED :	
DATE :	
APPROVED :	
DATE :	
SCALE	1:4000

CENTENNIAL MYUNA
MYUNA COLLIERY

TITLE
MYUNA COLLIERY SURFACE LAYOUT
SHOWING MINING PURPOSES LEASE
SURFACE FEATURES
AND
SURFACE WATER MANAGEMENT FEATURES

CAD FILE
N:\shared\PLANS\MY\MY11301.dwg
N:\shared\PLOT\MY\MY11301_rev3.pdf

PLAN NO. MY11301
REV. 3
A1

6.1 METEOROLOGICAL SUMMARY

Meteorological monitoring is completed in accordance with Schedule 3 Condition 20 of PA10_0080, Conditions M5.1 and M5.2 of Environment Protection Licence (EPL) 366 and Section 4.4.4 of the approved Northern Region Air Quality and Greenhouse Gas Management Plan. The location of the Myuna onsite weather station is shown on **Figure 6-1**, above. The weather station is maintained to conform to the requirements of the NSW EPA Approved Method AM-2 and NSW EPA Approved Method AM-4.

Table 6-2 below shows that rainfall at Myuna was above average with a total of 1,512mm for 2024, in comparison to an annual average of 1,116mm. The wettest months for 2024 were January and May, each recording 214.8mm and 234.6mm of rain, respectively.

Table 6-2: Meteorological Summary at Myuna Colliery

2024 Month	Rainfall (mm)	Cumulative Rainfall (mm)	Long-term average Rainfall (mm)[1]
January	214.8	214	108.9
February	18.2	233	135.4
March	18.2	251	125.1
April	354	605	117.1
May	234.6	839	93.8
June	135.8	975	102.6
July	101.2	1076	67.5
August	57.2	1134	59.9
September	105.4	1239	58.3
October	121.6	1361	68.7
November	137.6	1499	81.8
December	13.6	1512	96.6
Total	1,512	1,512	1,116

1. **Source:** Cooranbong (Avondale) Weather Station which has records since November 1902

6.2 NOISE

6.2.1 Environmental Management

The control strategies were implemented as per the Northern Region Noise Management Plan and were adequate to manage the risks associated with the operation during the reporting period.

The Northern Region Noise Management Plan outlines potential sources and impacts of elevated noise levels. The Plan also identifies measures which must be in place to reduce noise levels. All contractors and employees undergo induction and regular refresher training that identifies individual responsibilities for noise management.

Quarterly noise monitoring throughout 2024 has been conducted in accordance with the requirements of Schedule 3 Condition 11, 12, 13 and 14 of PA10_0080, and EPL 366.

Centennial Myuna commissioned SLR Consulting Australia Pty Ltd (SLR) to produce an annual compliance noise monitoring report for Myuna.

The report provides a summary of quarterly compliance noise monitoring of Myuna operations during 2024 and is provided in full at **Appendix 2.**

The noise monitoring programme for 2024 was completed for the following:

- Conduct operator attended noise surveys.
- Quantify all sources of noise within each of the attended noise surveys, including measured and/or estimated contribution and maximum level of individual noise sources.
- Assess the noise emissions of Myuna and determine compliance with respect to the limits contained in PA10_0080.

6.2.2   Environmental Performance

Table 6-3 below shows a summary of the noise monitoring data for Myuna 2024. Operator attended noise monitoring was conducted at four (4) locations to determine the noise contributions of Myuna with the relevant criteria. There were no exceedances or non-compliances for the 2024 reporting period. As of Q2 2023, the number of noise monitoring locations has been reduced to four and monitoring during the day and evening periods is no longer required in accordance with EPL366 and the Noise Management Plan approved by DPHI on 5 April 2023.

Table 6-3: Quarterly Noise Monitoring Results (LAeq15min)

Location	Q1	Q2	Q3	Q4	Criteria Limit
Night (LAeq (15 minute) dBA)					
R1	34	33	35	I/A[1]	35
R3	32	35	I/A[1]	30	35
R5	37	30	I/A[1]	30	39
R7	35	36	34	34	39
Sleep (LAeq (1 minute) dBA)					
R1	35	35	35	36	45
R3	33	39	I/A[1]	38	45
R5	40	31	37	35	45
R7	38	39	37	35	45

1.   I/A = Inaudible
2.   Within 2dB tolerance as per Section 11.1.3 of the NSW Industrial Noise Policy (INP). A development will be deemed to be in non-compliance with a noise consent or licence if the monitored noise level is more than 2dB above the statutory noise limit specified in the consent or licence condition.

6.2.3   Comparison against Predictions

Operational noise levels are predicted to continue to meet the project specific noise criteria and PA10_0080 conditions at all assessed residential receivers under calm and prevailing weather conditions.

6.2.4   Long Terms Analysis

The long term trend from the attended noise monitoring is summarised in **Table 6-4** below. There has been one noise exceedance in the past 5 years at Myuna.

Table 6-4: Summary of Exceedances by Noise Monitoring Location 2020 – 2024

Site ID	2020	2021	2022	2023	2024
R1	-	1	-	-	-
R3	-	-	-	-	-
R5	-	-	-	-	-
R7	-	-	-	-	-

6.2.5   Implemented / Proposed Improvements

Noise management controls are considered effective based on minimal non-compliances with the noise criteria outlined in **Table 6-4**. Myuna will continue to implement the approved Northern Region Noise Management Plan and review and update the plan as required by Schedule 5, Condition 5 of PA10_0080.

6.3   AIR QUALITY

6.3.1   Environmental Management

Control strategies were implemented as per the Northern Region Air Quality and Greenhouse Gas Management Plan (AQ&GHG MP) and were adequate to manage the risks associated with the operation during the reporting period.

The AQ&GHG MP outlines potential sources and impacts of elevated dust levels. The AQ&GHG MP also identifies measures which must be in place to reduce dust and environmental activities conducted to minimise elevated dust levels. All contractors and employees undergo induction and refresher training that identifies individual responsibilities for air quality management.

6.3.2   Environmental Performance

Schedule 3, Condition 17 of PA10_0080 provides the air quality criteria at any residence on privately owned land. These limits are reproduced below in **Table 6-5**.

Table 6-5: Dust Performance Criteria

Pollutant	Averaging Period	Criterion
Deposited Dust	Annual	Maximum Increase: 2 g/m^2/month
		Maximum Total: 4 g/m^2/month
Total Suspended Particulate (TSP) Matter	Annual	90 µg/m^3
Particulate Matter <10 µm (PM10)	Annual	30 µg/m^3
	24 hours	50 µg/m^3

Depositional Dust

Depositional dust monitoring was performed at Myuna during 2024 on a monthly basis at 3 depositional dust gauges.

The current air quality controls include enclosed conveyor and coal handling plant, water sprays on the conveyor system and haul road, mobile water cannon, a road sweeper and a water cart operating on site during coal haulage activities. Controls have been implemented in the reporting period.

Figure 6-2 below show the depositional dust rolling annual average results of Myuna for 2024 in comparison to the limits and EIS predictions. At all three dust gauges the annual averages were comparable to the long-term averages, within the maximum total limit of 4 g/m^2/month. The 2 g/m^2/month maximum annual average increase limit was not exceeded. DG2 was removed from the monitoring network in October 2023 and is no longer monitored following approval of the AQ&GHG MP version 6 by DPHI on 22 August 2023.
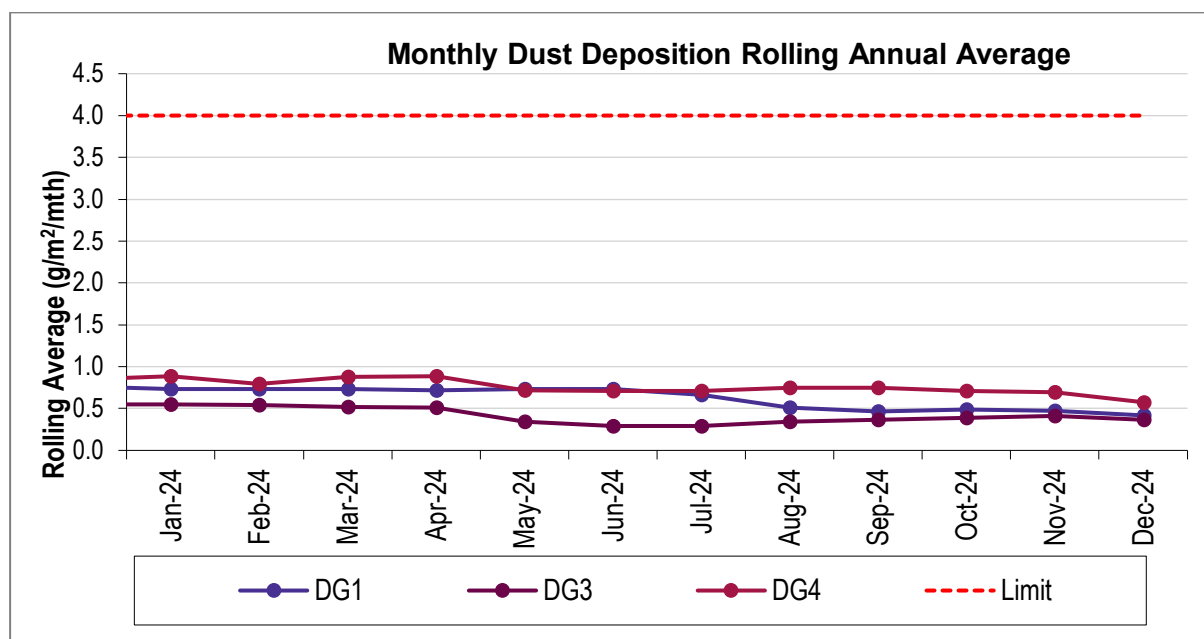
Figure 6-2: Monthly Depositional Dust Rolling Annual Average

High Volume Air Sampling

Air quality monitoring for PM10 and Total Suspended Particles (TSP) commenced in August 2013. The monitoring has been conducted in accordance with AQ&GHG MP and Condition M2 of EPL 366. **Figure 6-3** and **Figure 6-4** below show results for HVAS monitoring for 2024.

The 24-hour average and annual average results for PM10 are below the criteria of 50μg/m³ and 30μg/m³, respectively, remaining compliant with the limits set in PA10_0080 and the AQ&GHG MP. The annual average results for TSP are also below the criterion of 90μg/m³, maintaining compliance with the limits in PA10_0080 and the AQ&GHG MP.
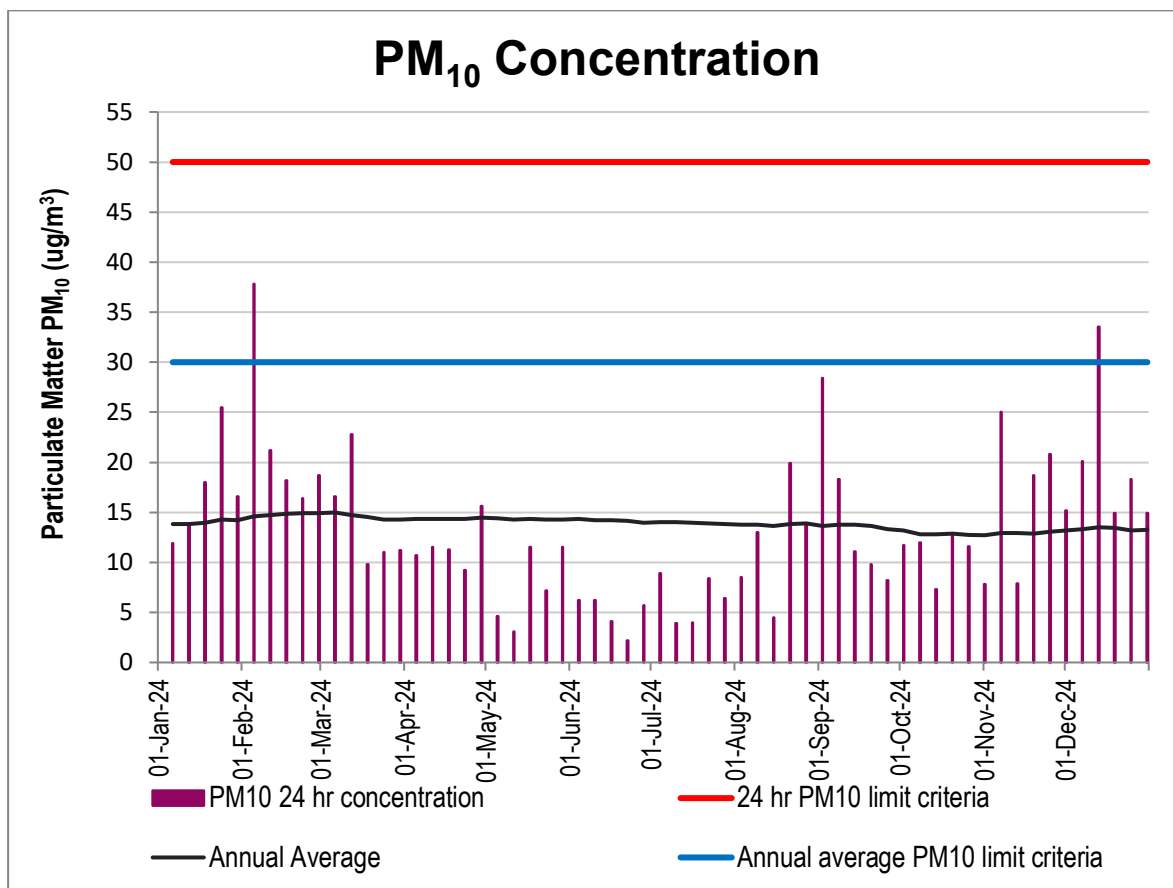
Figure 6-3: Annual PM^{10} Concentration Results (µg/m^3)
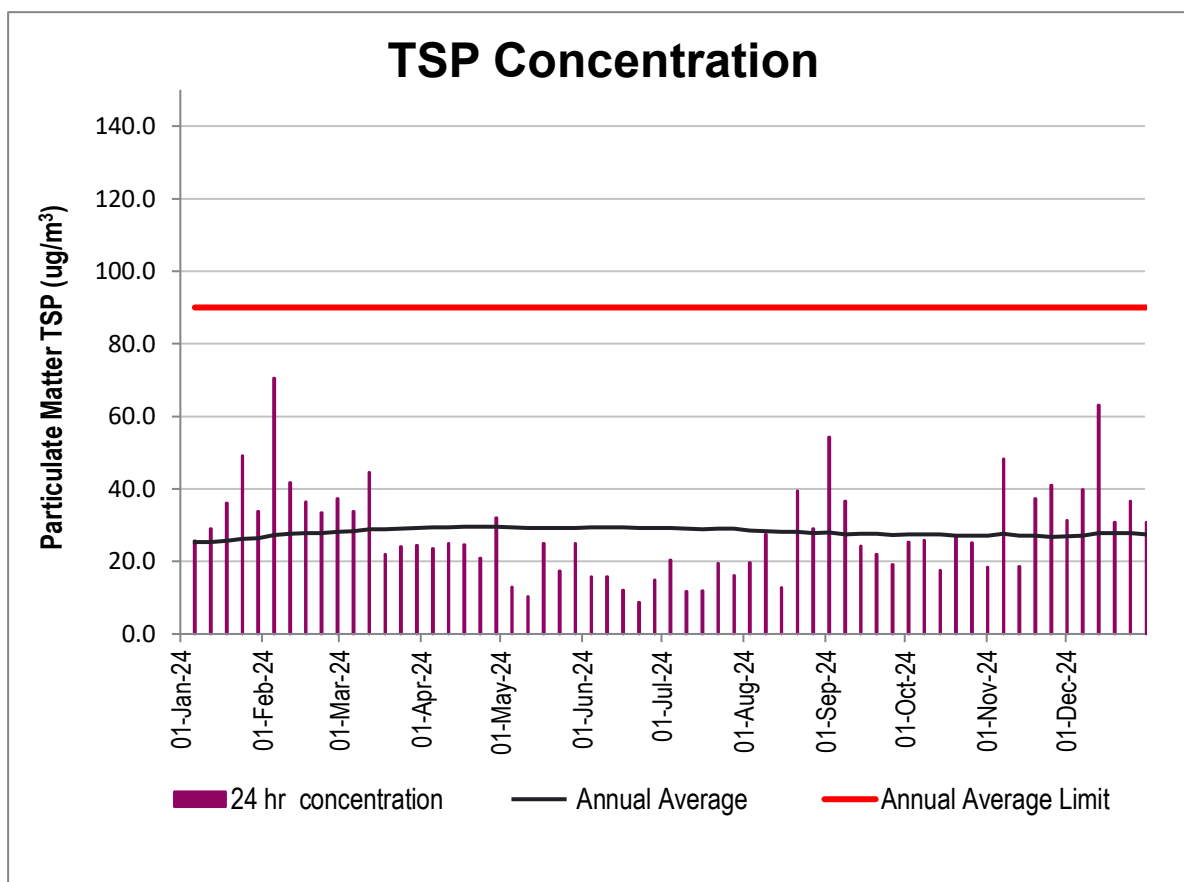
Figure 6-4: Annual TSP Concentration Results (µg/m^3)

6.3.3 Comparison against Predictions

The 2024 annual average and long-term average for each dust gauge is provided in **Table 6-6.** The 2024 annual averages for all dust gauges are less than the 19-year long term averages. The long-term trend lines of DG 3 and 4 display a slightly decreasing trend for the monthly dust deposition while DG 1 is stable. The Myuna Colliery Extension of Mining Project Air Quality Impact Assessment (Heggies 2010) predicted the cumulative annual average TSP and PM10 concentrations would be below the project air quality goal at all private receptors. Cumulative maximum 24-hour PM10 concentrations attributable to the Project were predicted to be below the project air quality goals at all surrounding dwellings excluding periods of regional pollution events. The TSP and PM10 results for the report period have been consistent with the EA predictions.

Table 6-6: Summary of Air Quality Sampling v EIS Predictions

Dust Monitor	Approval criteria	EIS / EA Predictions	Performance during the reporting period	Long Term Average
DG1	2 g/m^2/month Max Annual Average Increase	<0.1	-0.27	0.01
	4 g/m^2/month Total Annual Average	1.9	0.5	0.9
DG3	2 g/m^2/month Max Annual Average Increase	<0.1	-0.13	-0.06
	4 g/m^2/month Total Annual Average	1.9	0.4	1.3
DG4	2 g/m^2/month Max Annual Average Increase	<0.1	-0.14	0.0005
	4 g/m^2/month Total Annual Average	1.9	0.7	1.3
HVAS PM$_{10}$	30 µg/m^3 Annual Average	10.8	9.59	13.42
	50 µg/m^3 24 hr Average	10.5 to 51.7	8.57	13.42
HVAS TSP	90 µg/m^3 Annual Average	36.1	20.82	27.18

6.3.4 Long Term Analysis

There have been no exceedances of air quality criteria for the past 5 years. Generally, the concentrations measured for 2024 are consistent with long term trends. Long term trends for the three dust gauges, are shown in **Figure 6-5**, **Figure 6-6** and **Figure 6-7** below.
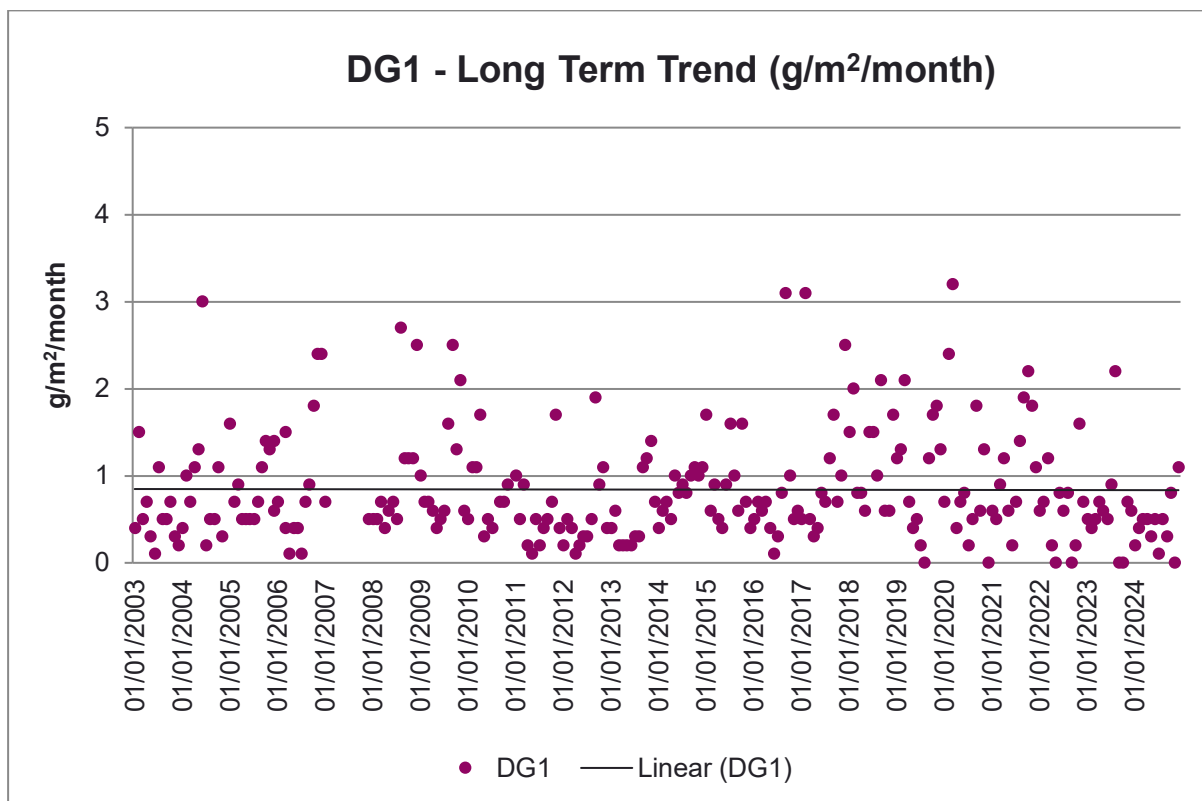
Figure 6-5: Long term trend analysis of depositional dust gauge 'DG1'.
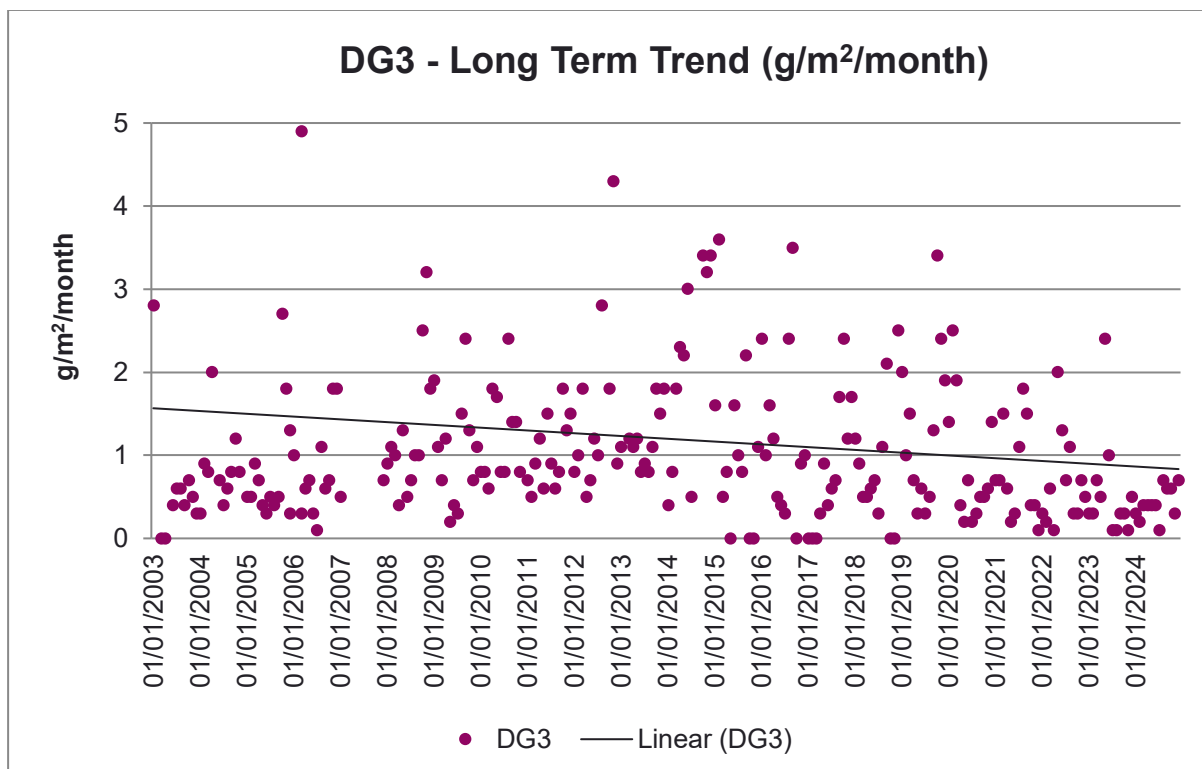
Figure 6-6: Long term trend analysis of depositional dust gauge 'DG3'.
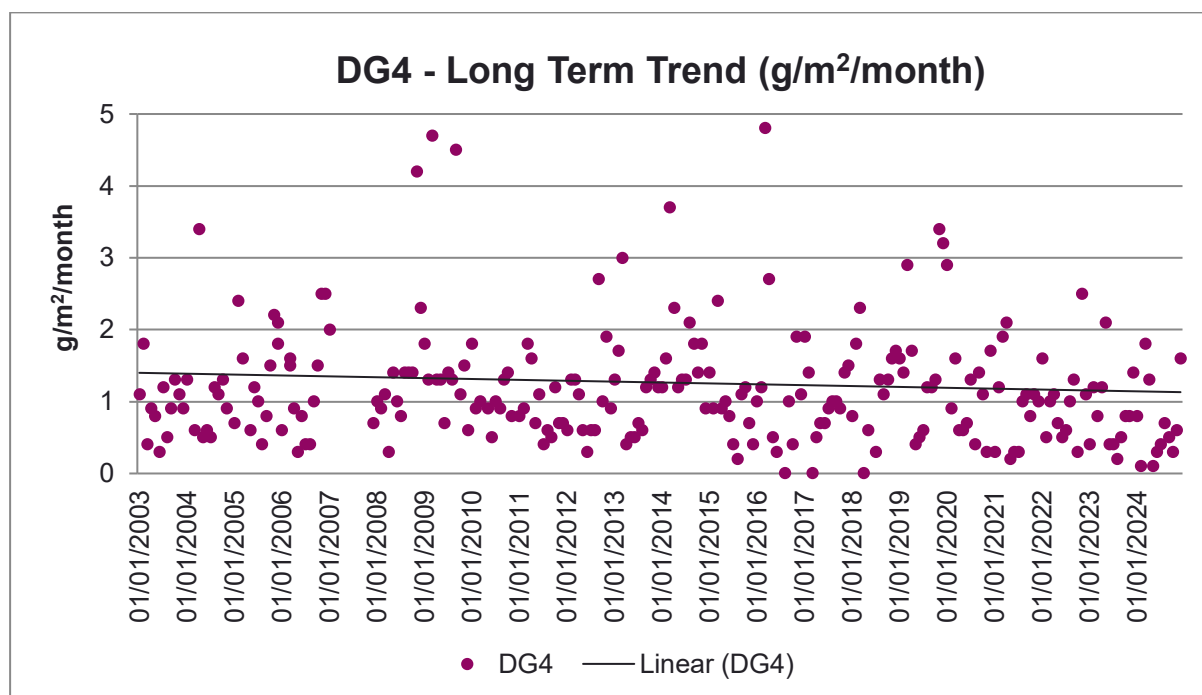
Figure 6-7: Long term trend analysis of depositional dust gauge 'DG4'.

6.3.5 Implemented / Proposed Improvements

Dust emission controls are considered effective based upon compliance with the air quality criteria during the Reporting Period. Myuna will continue to implement the AQ&GHGMP and review or revise this plan in accordance with Schedule 5, Condition 5 of the PA10_0080.

6.4 GREENHOUSE GAS MONITORING

6.4.1 Environmental Management

Greenhouse gas (GHG) reporting and management measures are provided in the AQ&GHG MP. GHG emissions from the Myuna will continue to be monitored and reported annually in accordance with the Commonwealth Government National Greenhouse and Energy Reporting System (NGERS).

6.4.2 Environmental Performance

Estimation of the GHG emissions associated with the Myuna was undertaken using the emission factors, methodology, and standards outlined by the following legislative instruments:

- National Greenhouse and Energy Reporting Act 2007
- National Greenhouse and Energy Reporting Regulations 2008
- National Greenhouse and Energy Reporting (Measurement) Determination 2008
- National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015

6.4.3 Comparison Against Predictions

Table 6-7 below provides the total emissions by source in carbon dioxide equivalent tonnes for the reporting period.

Table 6-7: Emissions Sources Comparison to EA Predictions

Emissions Sources July 2023 – June 2024	Total (t_{CO2-e})	*EIS / EA Prediction
Scope 1 Emissions (direct emissions)		
Coal Extraction (Fugitives)	191,749	576,593
Diesel Fuel	1,339.6	1,333
Oils	156.6	689
Greases	0	
SF6	3.7	0
Electricity	22,034	32,955
LPG	0	1
TOTAL	**213,783**	**611,571**

*EIS/ EA prediction was based on a production rate of 2MTPA

6.4.4 Implemented / Proposed Improvements

Reasonable and feasible steps were undertaken during the reporting period to improve energy efficiency and reduce greenhouse gas emissions generated by the mine, including the following:

- Cost effective measures to improve energy efficiency.
- Regular maintenance of plant and equipment to minimize fuel consumption.
- Consideration of energy efficiency in plant and equipment selection.
- Replacement of the aging ducted air conditioning unit in the administration building with individually controlled split systems in each office; and
- Replacement of fluorescent lights in the administration building with LED lights, where possible,

6.5 BIODIVERSITY

6.5.1 Environmental Management

Control strategies were implemented as per the Biodiversity Management Plan and were adequate to manage the risks associated with the operation during the report period.

The Biodiversity Management Plan for the site outlines measures in place to protect and enhance the Swamp Sclerophyll Forest on Coastal Floodplains Endangered Ecological Community (EEC) on Wangi Creek.

Myuna engaged a consultant to conduct monitoring of the EEC near Wangi Creek. The 2024 *Myuna Colliery Endangered Ecological Community Monitoring Report* (RPS, 2024) is provided in **Appendix 3.**

The annual EEC monitoring program is completed in accordance with Schedule 3, Conditions 28 (c) and (d) of PA10_0080.

The purpose of the monitoring is to determine if there is any measurable change in the health/ condition of Swamp Sclerophyll Forest on Coastal Floodplains EEC and *Callistemon linearifolious*; a species listed as vulnerable under the BC Act. Where change is detected, and

is deemed to be a negative change, the monitoring is to inform Myuna of the possible reasons for change and provide recommendation for the management of these changes.

6.5.2   Environmental Performance

The proportion of high threat weed species declined in VMA 1 from 2023 to 2024, however exotic species richness increased in Plot 1 and remained stable in Plot 2. Averaged results from plots within VMA 1 were above or equal to the PCT benchmark for habitat structure, with ecosystem function having mixed results and all but two attributes being above baseline for species composition. In comparison to the 2023 monitoring results, there was a slight improvement in habitat structure and ecosystem function, however species composition saw a decline. Of the six results equal to or below baseline recorded in VMA 1, four of these were repeated for habitat structure and ecosystem function. High variability in the total count of fallen logs is likely due to flooding events seen throughout the monitoring period.

VMA 2 (Plot 3) recorded the second highest native species count (above average) and highest proportion of native species since the commencement of monitoring in 2015. These results are consistent with the 2023 monitoring period, showing stability in native species richness between the two years. The number of exotic species within VMA 2 has been constant since 2023, however the number of high threat weeds declined since the previous monitoring period. Within VMA 2, species composition saw an overall decline from the 2023 results with all attributes recording results consistent with or below the baseline. On the contrary, habitat structure saw an improvement from the previous year's results and ecosystem function maintained the same results as 2023. VMA 2 exhibited nine triggers, in comparison to VMA 1 recording six triggers. A similar trend is seen for exotic species presence, with far higher presence in VMA 2. These results are likely a consequence of the initial condition of the plot and subsequent management over time.

The presence of rubbish was observed within or adjacent to all three flora monitoring plots, which may be a factor contributing to the introduction of exotic seed and the proliferation of weed species throughout the study area.

Variations in species composition and habitat structure could be influenced by several variables including:

- High water flow moving vegetative material and sediments throughout the creek line, transporting potential weed propagative material and removing lower stratum habitat features and vegetation;
- Seasonal variation in weather patterns influencing the occurrence of some species; and
- Potential minor variations in plot location (particularly at the edges of the plots).

The condition of *C.linearifolius* continued to slightly decline this monitoring period, with the 2024 results reflecting only one individual to be in healthy condition and five of the ten individuals experiencing a decrease in condition from the previous year. This continual trend of decline has been consistent since 2020, being related to the heavy water flow experienced within the riparian zone where most individuals occur. During the 2024 monitoring event, signs of stabilisation for five individuals were present which maintained the same condition score as the previous year.

Results from the 2024 EEC monitoring indicate no immediate impacts of concern on PCT 1649: *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions* EEC from mining related activities. Floristic data and comparisons of habitat attributes have remained relatively consistent with prior monitoring events, with any slight variations likely attributed to variability in precipitation and climatic factors unrelated to mining operations.

6.5.3 Comparison against Predictions

The Myuna Colliery Extension of Mining Project Terrestrial Flora and Fauna Assessment (RPS 2011) predicted due to negligible surface impacts that the project was unlikely to impact on any threatened species, endangered populations or threatened ecological communities.

6.5.4 Long Terms Analysis

The long term analysis can be found in the *Myuna Colliery Endangered Ecological Community Monitoring Report* (RPS, 2024) which is provided in **Appendix 3**.

6.5.5 Implemented / Proposed Improvements

The following actions will be undertaken in the coming year:

- Ongoing monitoring and appropriate management will continue to be implemented to ensure weed species recruitment in these VMAs will be constrained.
- Ongoing weed management, with a primary focus on those species that have the highest percent cover of the plot and are listed as high threat weeds. Species lists outlining target species can be found in Table 3-3, Table 3-6, Table 3-9 of Appendix 3.
- Removal of rubbish dumped within or adjacent to the VMAs to discourage further illegal dumping.

6.6 HERITAGE

6.6.1 Environmental Management

Myuna manages Aboriginal heritage in accordance with the Northern Region Aboriginal Cultural Heritage Management Plan (ACHMP) and European heritage in accordance with the Northern Region Historic Heritage Management Plan (HHMP). The Management Plans were considered adequate to manage the risks associated with the operation during the reporting period.

6.6.2 Environmental Performance

There was no disturbance or undermining of known Aboriginal heritage or European heritage sites during the Reporting Period. No monitoring was required under the HHMP or ACHMP at Myuna.

6.6.3 Comparison against Predictions

The Myuna Colliery Extension of Mining Project Cultural Heritage Assessment (RPS 2011) considered there was minimal potential for impact from the Project on sensitive Aboriginal cultural places or objects or on European cultural heritage items.

6.6.4 Implemented / Proposed Improvements

The Northern Region Aboriginal Cultural Heritage Committee (ACHC) meetings were held in March and September 2024. Myuna will continue to undertake Northern Region ACHC meetings in the next Reporting Period.

Key agenda items discussed in 2024 in relation to Myuna were:

- Ongoing inspection, monitoring, reporting and compliance activities;

- Outcomes from the 2024 Independent Environmental Audit;

- Updates of any non-compliances and community complaints; and

- Site Environmental and Community program implementation.

The pre-clearance permit systems in the WRACHMP provides the land disturbance due diligence process, implemented by the site, and is considered appropriate for the management of Aboriginal heritage items.

6.7 MINE SUBSIDENCE

Myuna has a requirement to limit vertical subsidence within Zone A to a maximum of 20mm for first workings as per Schedule 3 Condition 1 of PA10_0080. Myuna's mine design was assessed and approved on the basis that first workings are designed and mined according to industry standards so that workings are long term stable and non-subsiding (resulting in negligible impacts). Subsidence monitoring within Zone A is completed as due diligence with no measured subsidence beyond the 20mm limit in Zone A.

The Myuna Extraction Plan for Panels 1121 and 1123 was approved by the DPHI in October of 2024 with the 1121 panel extraction completed in December 2024. The areas within the Myuna holding boundary where secondary workings are permitted, is referred to as Zone B with a maximum allowable vertical subsidence of 650mm.

6.7.1 Environmental Management

6.7.1.1 Subsidence Monitoring (Secondary Extraction)

Myuna complete subsidence monitoring in accordance with the Subsidence Monitoring Program as required by PA10_0080 Schedule 3 Condition 8 (J). As the entirety of the proposed secondary extraction area is located beneath Lake Macquarie, Centennial Myuna undertakes bathymetric surveys of the lakebed to monitor changes in lakebed height as an indicator of subsidence. A baseline bathymetric monitoring regime over the proposed secondary extraction area was completed during May 2024 prior to the commencement of secondary extraction to understand the background lakebed depth levels. Centennial Myuna will also undertake bathymetric surveys post extraction of each panel to understand any mining-related changes to the lakebed depths in comparison to the baseline surveys.

The hydrographic survey is carried out using multi beam technology from a NORBIT Winghead i77 h Ultra High-Resolution curved array Bathymetric system – Multi Beam Echo Sounder (MBES), with an integrated GNSS/ISS positioning system. Also integrated into the head of the MBES is an inertial measuring unit (IMU). The IMU measures Heave, Pitch and Roll of the carrier vessel. The Surveys will be conducted using MGA2020 projection and AHD (Australian Height Datum). The target spacing of X Y Z Point capture is 10 m x 10 m. Astute Surveying has been engaged to carry out the specialty Hydrographic Survey.

It is noted that comparative analysis of bathymetric surveys is likely to highlight lakebed depth changes which are unrelated to mining, most likely caused by subsurface sediment movement resulting from current action in Lake Macquarie. It is also noted that limitations in surveying lakebed changes in water depths experienced throughout the Extraction Plan Area may potentially result in inaccuracies in the order of +/- 100 mm. As a result, it is anticipated that comparing lakebed depth changes from pre and post panel extraction may result in discrepancies of up to 200 mm from actual results.

6.7.1.2 Seagrasses

Myuna completed seagrass monitoring in accordance with the Seagrass Management Plan as required by PA10_0080 Schedule 3 Condition 8 (h). Centennial Myuna will complete an annual (during Autumn) seagrass survey at the locations outlined in **Table 6-8** and **Figure 6-8** throughout secondary extraction of Panels 1121 and 1123, until two years post-extraction.

Table 6-8: Seagrass Monitoring Locations

Survey Site	Survey Location	Easting	Northing
MSG1	Cams Wharf (control)	56370508	6334904
MSG2		56370622	6334618
MSG3		56370652	6334513
MSG4		56370754	6334274
MSG5		56370776	6334167
MSG6	Point Wolstoncroft (impact)	56367999	6335405
MSG7		56368064	6335300
MSG8		56368201	6335138
MSG9		56368313	6334047

Data collected during annual seagrass surveys will be analysed to determine whether any impacts or significant changes are due to mining induced subsidence. Statistical analysis comparing control sites with impact sites will be undertaken following annual monitoring. If a decline in seagrass coverage is detected at the impact site relative to the baseline survey, and that this decline is significantly greater than detected at any of the control sites then the TARP will be followed. Statistical analysis may include all or a combination of the following: Univariate, ANOSIM and MDS ordination, depending on the nature of the change and with consideration of external environmental factors. It is noted that significant natural variance has been observed in the absence of subsidence impacts through the past 10 years of monitoring at the neighbouring Chain Valley Colliery

6.7.1.3 Benthic Organisms

Myuna complete benthic communities monitoring in accordance with the Benthic Communities Management Plan as required by PA10_0080 Schedule 3 Condition 8 (g). Centennial Myuna will complete biannual (Autumn and Spring) benthic community monitoring at the locations depicted in **Table 6-9** throughout secondary extraction of Panels 1121 and 1123 until two years post-extraction. Monitoring will be conducted by a suitably qualified and experienced specialist and include collation of data regarding:

- Benthic species composition, diversity and abundance data;
- Water quality parameters; and
- Lakebed sediment.

Table 6-9: Benthic Communities Monitoring Sites

Station	Type	Depth Zone (m)	GDA 2020 Easting	GDA 2020 Northing
BMP1	Control	-3 to -7 m AHD	370468	6334983

Station	Type	Depth Zone (m)	GDA 2020 Easting	GDA 2020 Northing
BMP2	Control	-7 to -10 m AHD	370192	6334648
BMP3	Control	-7 to -10 m AHD	370141	6334375
BMP4	Control	>-10 m AHD	370169	6334837
BMP5	Control	-7 to -10 m AHD	369759	6335105
BMP6	Control	>-10 m AHD	369571	6335173
BMP7	Control	-3 to -7 m AHD	370378	6334217
BMP8	Impact	-7 to -10 m AHD	368648	6335668
BMP9	Impact	-7 to -10 m AHD	368306	6335404
BMP10	Impact	>-10 m AHD	368904	6335285
BMP11[1]	Impact	-3 to -7m AHD	368540	6335240

6.7.1.4 Built and Natural Features

Myuna manage built and natural features in accordance with the Built Features Management Plan as required by PA10_0080 Schedule 3 Condition 8 (i). Built and natural features located within and outside of the Extraction Plan Area were identified in MSEC(2024) as well as through baseline data collection completed for each of the sub-plans.

Relevant features within the Extraction Plan Area:

- Mining-related exploration borehole CMR100. This borehole is a hole drilled from the surface of the lake to the top of bedrock under Lake Macquarie to assist in determining the bedrock level of the lake (total core length approximately 2 m). Mining borehole CMR100 does not intersect any coal seams; and
- Benthic communities within lakebed sediments.

Features identified outside of the Extraction Plan Area:

- Jetties and boat ramps;
- Buoys, moorings and navigation markers;
- Marine nets;
- Mining-related exploration boreholes;
- Residential buildings, other structure and services along the lake foreshore;
- Survey control marks;
- Rock outcrops; and
- Seagrass beds.

It is also noted that no subsurface infrastructure (e.g. pipelines, cables etc.) were identified within the Extraction Plan Area as per the outcomes of a Before You Dig Australia search completed to inform the Panels 1121 and 1123 Built Features Management Plan (Centennial Coal, 2024c).

6.7.1.5 Public Safety

Myuna manages public safety in accordance with the Public Safety Management Plan as required by PA10_0080 Schedule 3 Condition 8 (k). There are no predicted public safety impacts due to the lack of relevant features within the extraction plan area as prescribed above. While no impacts to public safety are predicted, Centennial Myuna will monitor for subsidence-related impacts in accordance with the Myuna Colliery Extraction Plan 1121, 1123 Subsidence Monitoring Program. In the unlikely event subsidence-related impacts are observed, Centennial Myuna will implement measures in accordance with the Trigger Action Response Plan (TARP) of the Public Safety Management Plan.

FIGURE 4.1

Seagrass and Benthic Community Monitoring Locations

Legend
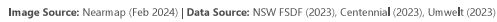
— Project Approval Boundary - MP10_0080 (MOD 3)
▭ Centennial Myuna-held Mining Leases
▮ National Parks (NPWS Estate)
▯ Property Boundaries
— Main Roads
— Roads
— Non-perennial Watercourses
▰ Zones A and B Boundaries at the Surface
▭ Extraction Plan Area
Proposed Workings

Benthic Community Monitoring Locations
● Impact Monitoring Site
● Control Monitoring Site

Seagrass Monitoring Locations
● Impact Monitoring Site
● Control Monitoring Site

0   300   600
Metres

Scale: 1:15,000 at A3
GDA2020 MGA Zone 56

Image Source: Nearmap (Feb 2024) | Data Source: NSW FSDF (2023), Centennial (2023), Umwelt (2023)

6.7.2 Environmental Performance

6.7.2.1 Subsidence Monitoring (Bathymetric Survey)

Table 6-10 below shows the results of lake floor bathymetric survey in comparison to predicted subsidence levels of the extraction panels 1121 and 1123.

Table 6-10: Subsidence Results

Secondary Extraction Panel	Approved S_{max} (mm)	Predicted S_{max} (mm)	Measured S_{max}(mm)	Panel Extraction Completion Date	Monitoring Frequency
1121	650	<100	50 – (+100)[1]	December 2024	Annually for 2 years post-mining
1123	650	<100	N/A[2]	TBA	Annually for 2 years post-mining

1. Within survey error of equipment

   Extraction Panel 1123 extraction is scheduled for H2 of 2025.

6.7.2.2 Seagrass and Benthic Communities Monitoring

Seagrass and Benthic communities postmining monitoring will be completed in April in 2025 and communicated in the 2025 Annual Review and uploaded onto the website.

6.7.2.3 Built Features and Public Safety

There are no built features or public safety issues identified within the extraction plan area.

6.7.3 Comparisons against Predictions

Table 6-11 below shows the performance measures for subsidence impacts to biodiversity, built features and public safety. There has been no exceedance of approved limits or predicted impacts. Post mining aquatic ecology surveys for the extraction panel 1121 are yet to be completed and are scheduled for Autumn 2025. Subsidence levels as shown in **Table 6-10** demonstrate compliance with the approved maximum subsidence (mm) and within the predicted range.

Table 6-11: Assessment of Subsidence Performance against Performance Measures and Predicted Impacts

Feature	Subsidence Performance Measures	Predicted Subsidence Impact EIS	Assessment of Performance against Predicted Impact
Biodiversity			
Threatened species, populations, or their habitats and EEC	Negligible impact or environmental consequences.	Negligible impacts	Compliant – No endangered species affected
Seagrass beds	Negligible environmental consequences including: • negligible change in the size and distribution of seagrass beds;	Negligible impacts	No data available at this stage. Monitoring to

Feature	Subsidence Performance Measures	Predicted Subsidence Impact EIS	Assessment of Performance against Predicted Impact
	• negligible change in the functioning of seagrass beds; and • negligible change to the composition or distribution of seagrass species within seagrass beds.		commence in 2025.
Benthic communities	Minor environmental consequences, including minor changes to species composition and/or distribution.	Negligible impacts	No data available at this stage. Monitoring to commence in 2025.
Built Features			
Key public infrastructure: Eraring Power Station Ash Dam	Negligible impact or consequence.	Negligible impacts	Compliant – outside of scope of current operations
Other public infrastructure (including sewage pipes; power and telecommunications cables). Other built features (including jetties and boat moorings)	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repaired, replaced or fully compensated.	Negligible impacts	Compliant – outside of scope of current operations
Public Safety			
Public Safety	Negligible additional risk.	Negligible impacts	Compliant.

6.8   OTHER MATTERS

6.8.1   Waste

Opportunities for waste avoidance and minimisation are considered by all staff and contractors across all areas including contracts, purchasing, equipment procurement and waste generation processes. Waste oil and greases are stored in tanks and drums within bunded areas for removal by a licenced waste management contractor for recycling or disposal. Oil water separation is achieved using mop oil water separators. Hydrocarbon spill kits are inspected weekly by a licenced waste management contractor and re-stocked as required. Oily rag bins and oil filter bins are also serviced on a weekly basis. Office paper and cardboard is collected and recycled by a licenced waste management contractor on a weekly basis. Metals are separated into steel bins and sent for recycling. In 2024, a total of 348.6 tonnes of scrap steel was recycled. General refuse and non-recyclable materials are sorted and stored in 30m3 steel bins. The material was collected by a licenced waste management contractor for disposal. Of the total waste collected at Myuna in 2024, 34.8% was recycled including steel, timber, liquid waste, oils, paper and cardboard, filters grease, oily rags and oil filters. This compares with a recycling result of 28.1% in 2023.

7   WATER MANAGEMENT

Myuna managed both surface water and groundwater in accordance with the approved Water Management Plan (WMP). The control strategies were implemented as per plan and were adequate to manage the risks associated with the operation during the report period.

Myuna's WMP which discusses responsibilities, pollution sources, hazards, risks and mitigation strategies of water management. Regular refresher training and site inductions discuss water management to make personnel aware of the site issues.

The surface water monitoring has been conducted in accordance with the conditions of EPL 366 and the Water Management Plan. EPL 366 specifies monitoring and reporting requirements along with concentration limits for water discharged through LDP 9 and LDP 10. Other EPL monitoring requirements included E1 Manganese monitoring in Wangi Bay.

7.1   WATER LICENSES

WAL 41560 has superseded Bore Licence 20MW065029, which was granted in December 2010 for the purpose of dewatering up to 4380 ML/ year of ground water from mine workings at Myuna. Ground water extracted from the underground mine workings is currently discharged from site via LDP 9. Volumetric and water quality monitoring data at LDP 9 is therefore representative of ground water volumes and ground water quality extracted from the mine workings.

The volume of ground water extracted from the workings authorised by the licence shall not exceed 4380 ML in any twelve-month period. The total volume of water discharged through LDP 9 for 2024 is 1654ML. There were no exceedances of the volume limit criteria during the reporting period. There were three days where the flow monitor was offline during the reporting period at LDP 9. This downtime was due to a temporary breakdown caused by a faulty controller card.

Table 7-1 reports on the 'Water Year' from 1 July 2023 to 30 June 2024.

Table 7-1: Water Take (ML)

Licence	Water sharing plan, source and management zone	Annual Entitlement (ML)	Passive take/ inflows (ML)	Active pumping (ML)	TOTAL (ML)
WAL 41560	North Coast Fractured and Porous Rock Ground Water Sources	4,380	0	2,092	2,092

7.2   WATER BALANCE

The Wallarah, Great Northern and Fassifern seams contain reservoirs which are used for the retention and settlement of mine water and surface water prior to pumping to the surface settlement ponds. The pump line and syphon line are metered for the purpose of measuring the volume pumped to the underground. The volume of surface water pumped to the underground reservoir during the 2024 reporting period was approximately 57.5 ML.

The underground water storages in the Wallarah Seam, the Great Northern Seam and the Fassifern Seam are based on an average seam height of 3 m and a recovery ratio of 0.333, Centennial Myuna has estimated the volume of water storages in each of the seams. The underground water storage volumes are shown below in **Table 7-2.** below.

Table 7-2: Site Water Balance – GoldSIM Modelling Output

| Centennial Myuna 2024 Water Balance	Volume (ML)
Water Sources (Inflows)	
Surface Water	99
Groundwater	5
Entrained Water	2381
Third Party Water	96
Total Inputs	**2653**
Water Loss (Discharge)	
Surface Water Discharge (LDP 9)	1670
Sewage	9
Total Loss (Discharge)	1679
Water Loss (Consumption)	
Underground Pumping Loss	427
Evaporation	4
Entrained water	72
CHP Hosing	2
Total Loss (Consumption)	**506**
Change in Storage	
Storage Volume at start	2999
Storage Volume at end	3468
Total Change in Storages	**469**
Water Balance	
Change in water inventory (inputs – outputs – change in storage)	**0**
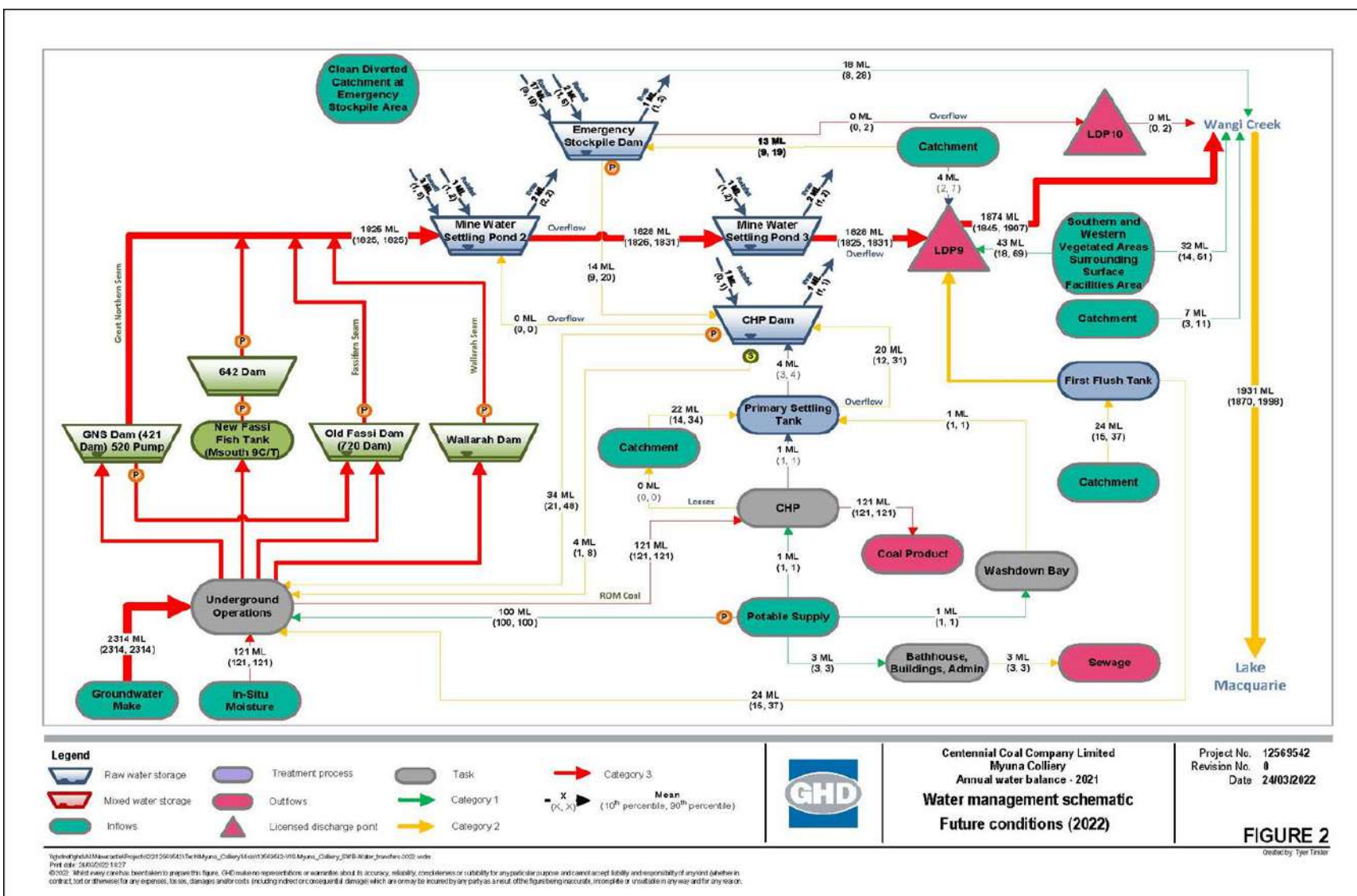
Figure 7-1: Myuna Water Balance Schematic

7.3 SURFACE WATER

7.3.1 Environmental Management

Mine water discharged from LDP 9 is required to be monitored monthly during discharge for the following parameters:

- Volume;
- pH;
- Total Suspended Solids (TSS); and
- Oil and Grease.

Discharge of mine water occurred on every month in the reporting period. A sample was collected and analysed for the parameters each month of discharge. In 2023 the water monitoring program prescribed in the WMP was updated to reflect recent variations to EPL 366. Daily sampling at LDP 9 has been reduced to monthly during discharge. This change was approved in the WMP in June of 2023.

7.3.2 Environmental Performance

The flow volumes through LDP 9 are monitored continuously in accordance with EPL366. The daily volume discharge limit for LDP 9 is 13000 kL. The maximum daily volume discharged was 10,467 kL during the reporting period. The average daily volume discharged for 2024 was 4,534 kL. There were no exceedances of the LDP 9 volume limit criteria during the reporting period.

The pH of the mine water discharged through LDP 9 was consistent throughout 2024 with a minimum pH level of 7.5 and a maximum of 7.7 The limit criterion for pH is a range between 6.5 and 8.5. There were no exceedances of this limit during the reporting period.

The concentration of total suspended solids analysed in the mine water discharged through LDP 9 was consistently low with an average concentration of 17 mg/L and a maximum concentration of 36 mg/L during 2024. The concentration limit for TSS is 50 mg/L. There were no exceedances of this limit during the reporting period.

The concentration of oil and grease analysed in the mine water discharged through LDP 9 was consistently low with a maximum of 0 (<5) mg/L for the reporting period. The concentration limit for oil and grease is 10 mg/L. There were no exceedances of this limit during the reporting period.

Results of the main water quality analytes for LDP 9 for the reporting period are provided in **Table 7-3** and **Table 7-4** and **Figure 7-2, Figure 7-3** and **Figure 7-4**. There was no discharge from LDP 10 in 2024 as shown in **Table 7-5.**

Table 7-3: LDP 9 Water Volume

Monitoring Point Reference	Frequency	No. of Measurements made	Lowest Result (kL)	Mean Result (kL)	Highest Result (kL)	EPL Limit (kL)
LDP 9 (EPL Point 9)	Daily During Discharge	366	0	4,534	10,467	13,000

Table 7-4: LDP 9 Water Quality Results Summary 2024

Pollutant	Unit	No. of Samples required	No. of Samples collected and analysed	Lowest sample value	Mean of samples	Highest sample value	EPL Limit[1]
pH	pH	12	12	0	0	0	6.5 – 8.5
Total Suspended Solids	mg/L	12	12	7.5	7.7	8.0	50
Oil & Grease	mg/L	12	12	0.0	17	36.0	10

[1] EPL: Limits is also the Environmental Assessment recommended trigger level.

Table 7-5: LDP 10 Water Quality Results Summary 2024

Pollutant	Unit	No. of Samples required	No. of Samples collected and analysed	Lowest sample value	Mean of samples	Highest sample value	EPL Limit[1]
pH	pH	0	0	0	0	0	6.5 – 8.5
Total Suspended Solids	mg/L	0	0	0	0	0	50
Oil & Grease	mg/L	0	0	0	0	0	10

[1] EPL: Limits is also the Environmental Assessment recommended trigger level.

LDP 9 pH
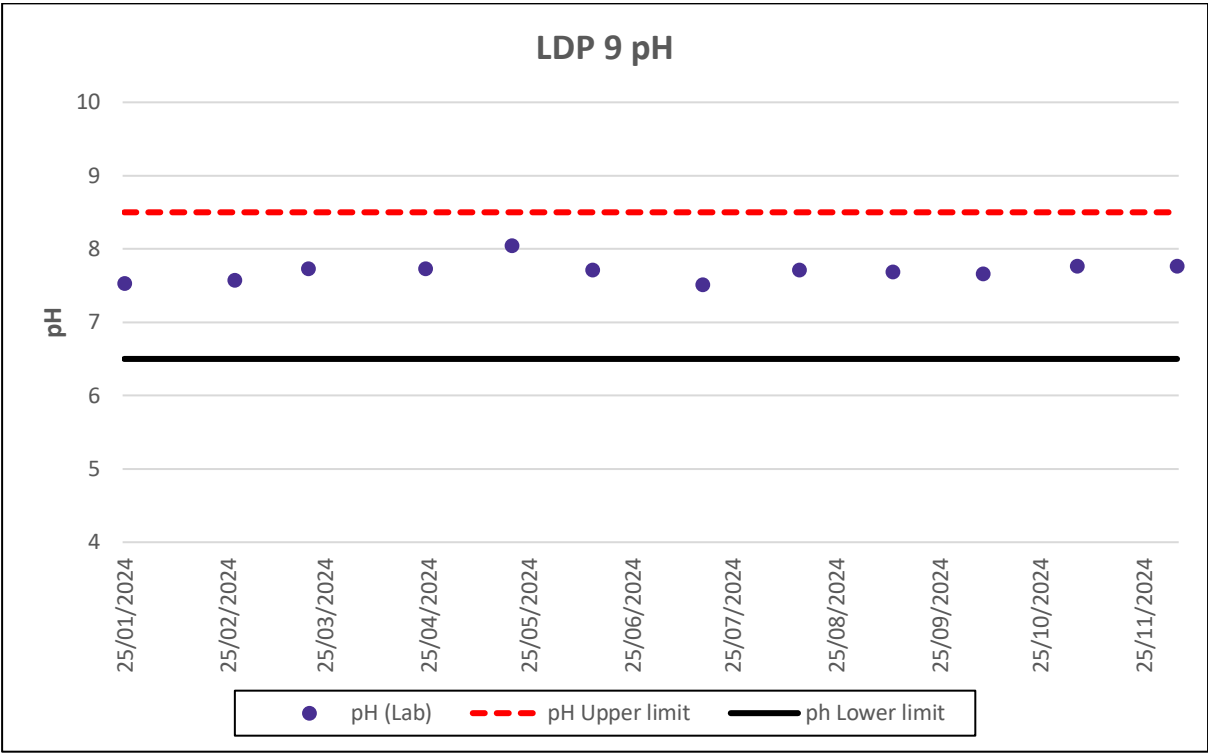
Figure 7-2: LDP 9 Monitoring Results – pH

LDP 9 TSS (mg/L)
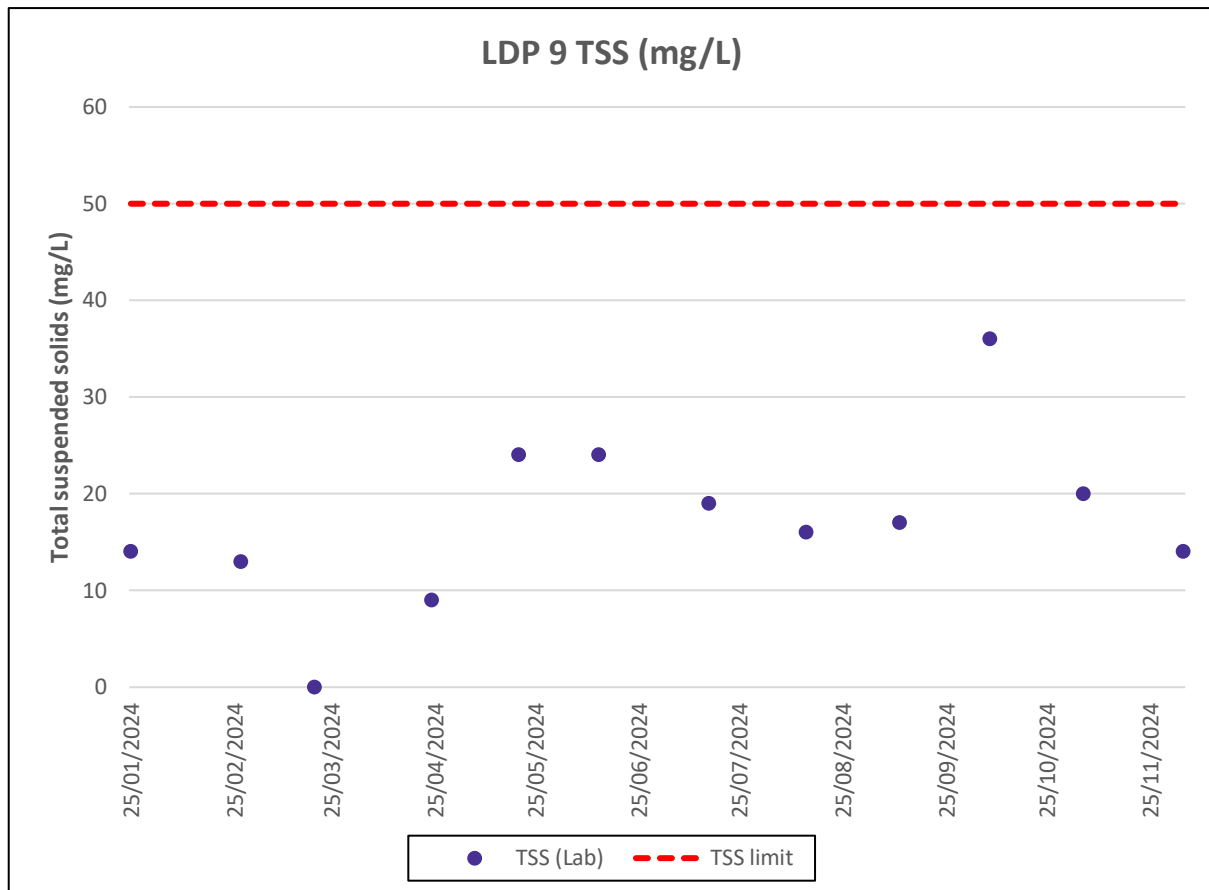
Figure 7-3: LDP 9 Monitoring Results - Total Suspended Solids (mg/L)

LDP 9 Oil and Grease (mg/L)
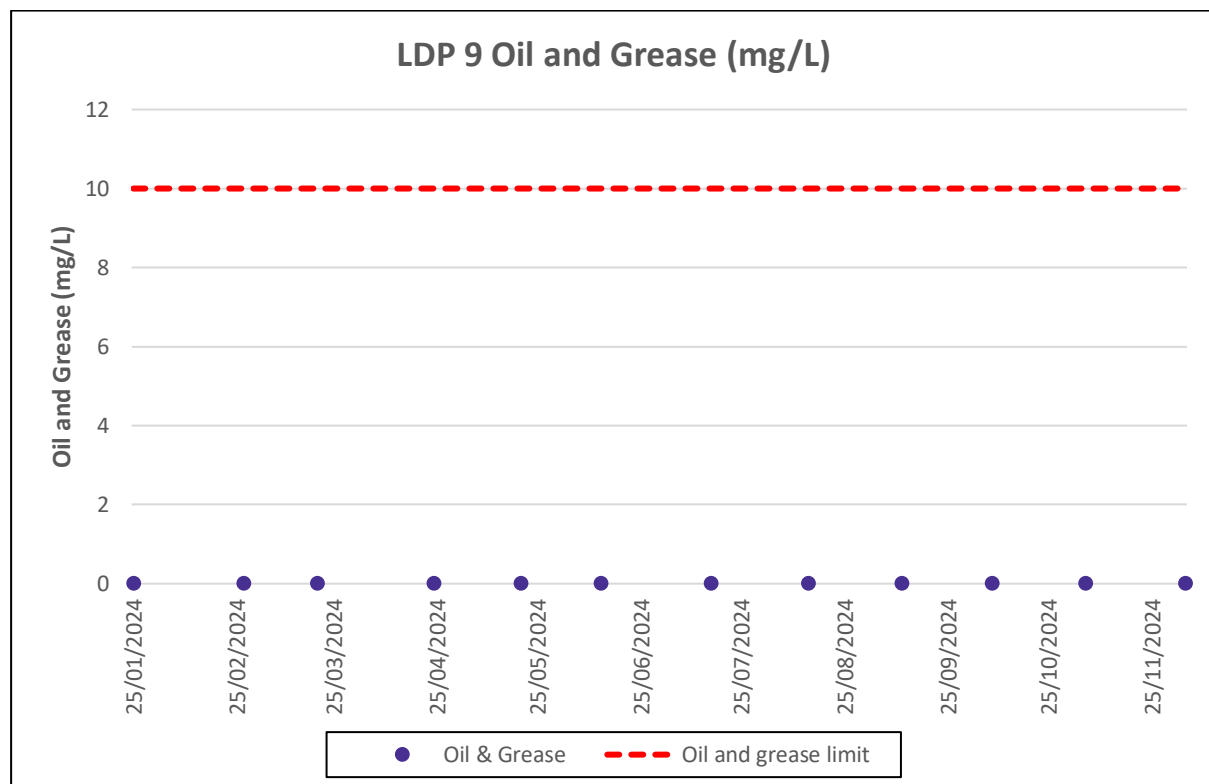
Figure 7-4: LDP 9 Monitoring Results - Oil and Grease (mg/L)

7.3.3 Comparisons against Predictions

There have been no exceedances of licence criteria or EA predictions.

7.3.4 Long Term Analysis

As shown in the **Figure 7-5, Figure 7-6** and **Figure 7-7** below, linear trend lines were applied to the monitoring data from 2011 to December 2024 for pH, TSS and Oil & Grease. The trend lines show that results have been relatively consistent over this period.
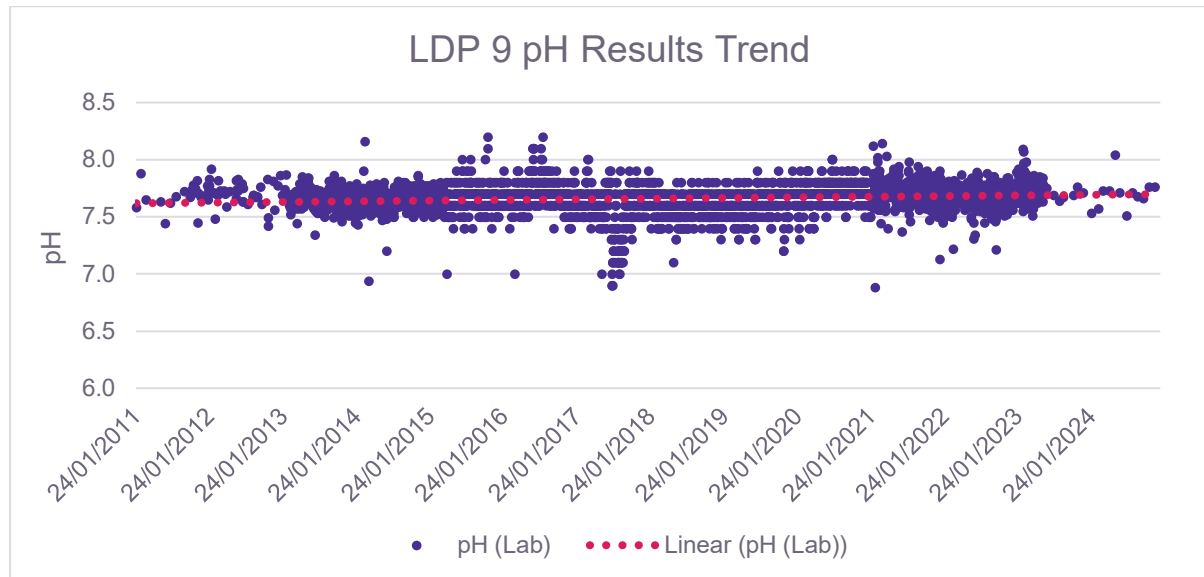
Figure 7-5: LDP 9 Long Term (pH)
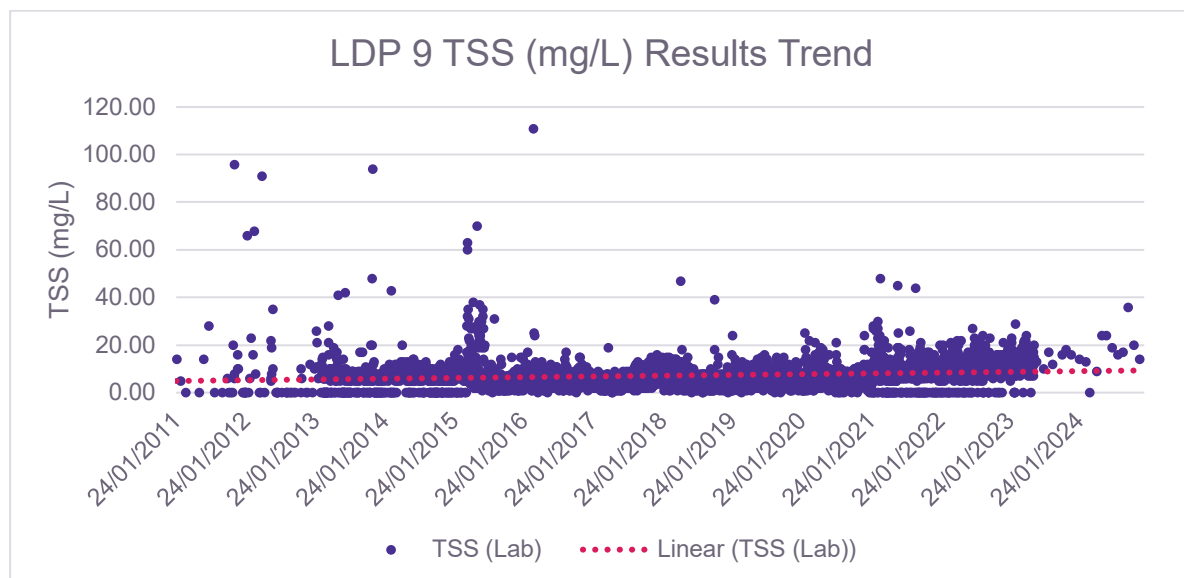
Figure 7-6: LDP 9 Long Term TSS (mg/L)
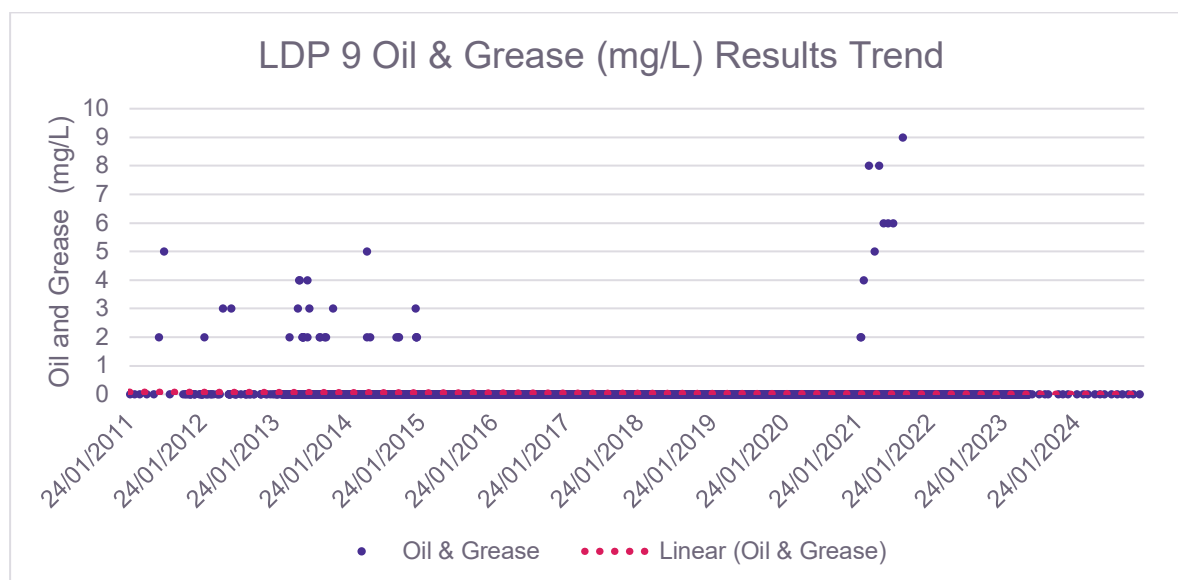
Figure 7-7: LDP 9 Long Term Oil and Grease (mg/L)

7.3.5 Implemented / Proposed Improvements

Surface Water Management controls are considered effective based upon compliance with the water quality criteria during the Reporting Period. Myuna will continue to implement the WMP and review or revise this plan in accordance with Schedule 5, Condition 5 of the PA10_0080.

7.4 GROUNDWATER

7.4.1 Environmental Management

In November 2017, Myuna commenced monitoring of groundwater levels around the pit top area. The groundwater monitoring network includes ten shallow alluvial monitoring bores which were installed in August 2012. Details of the groundwater monitoring bores are provided below in **Table 7-6**. Groundwater bores have been monitored monthly until May 2023 and are now monitored quarterly in line with recent updates to the approved Myuna Water Management Plan.

Table 7-6: Groundwater Monitoring Network

Bore	Monitoring Period	Lithology	Bore Depth (m)	Monitoring Parameters
MW01	Nov 2017 – Ongoing	Alluvium	6	Groundwater Level
MW05	Nov 2017 – Ongoing	Alluvium	18.5	Groundwater Level
MW06	Nov 2017 – Ongoing	Alluvium	13	Groundwater Level
MW07	Nov 2017 – Ongoing	Alluvium	8.5	Groundwater Level
MW08	Nov 2017 – Ongoing	Alluvium	9	Groundwater Level
MW09	Nov 2017 – Ongoing	Alluvium	7	Groundwater Level

Bore	Monitoring Period	Lithology	Bore Depth (m)	Monitoring Parameters
MW10	Nov 2017 – Ongoing	Alluvium	10	Groundwater Level
MW11	Nov 2017 – Ongoing	Alluvium	7	Groundwater Level
MW12	Nov 2017 – Ongoing	Alluvium	8	Groundwater Level
MW13	Nov 2017 – Ongoing	Alluvium	11	Groundwater Level

7.4.2   Environmental Performance

As shown above in **Section 7.4.1**, the groundwater monitoring network at Myuna Colliery includes ten alluvial monitoring bores. Observed groundwater levels at these monitoring bores for 2024 are shown below in **Table 7-7.**

Table 7-7: Alluvial Groundwater Levels for Myuna Colliery

Bore	Q1	Q2	Q3	Q4	EIS Prediction
MW01	19.4	19.8	19.4	19.4	Minimal Impact
MW05	13.6	14.0	14.0	13.7	Minimal Impact
MW06	13.3	13.4	17.1	13.6	Minimal Impact
MW07	21.8	22.0	18.8	22.2	Minimal Impact
MW08	20.4	20.8	21.4	21.4	Minimal Impact
MW09	16.5	17.3	17.1	17.2	Minimal Impact
MW10	22.9	23.9	25.0	24.9	Minimal Impact
MW11	9.8	10.2	10.3	10.3	Minimal Impact
MW12	6.9	8.1	7.5	7.6	Minimal Impact
MW13	2.2	3.1	2.5	2.4	Minimal Impact

7.4.3   Comparison against Predictions

Groundwater levels at all monitoring locations remained relatively stable during the reporting period. No mining or has occurred within the vicinity of the monitoring bores within the previous year.

7.4.4   Long Term Analysis

Figure 7-8 below shows the long term trend in groundwater water levels (m AHD). Groundwater levels have been relatively stable at all other groundwater monitoring locations since November 2016. There have been no exceedances or impacts to alluvial groundwater levels since monitoring began.
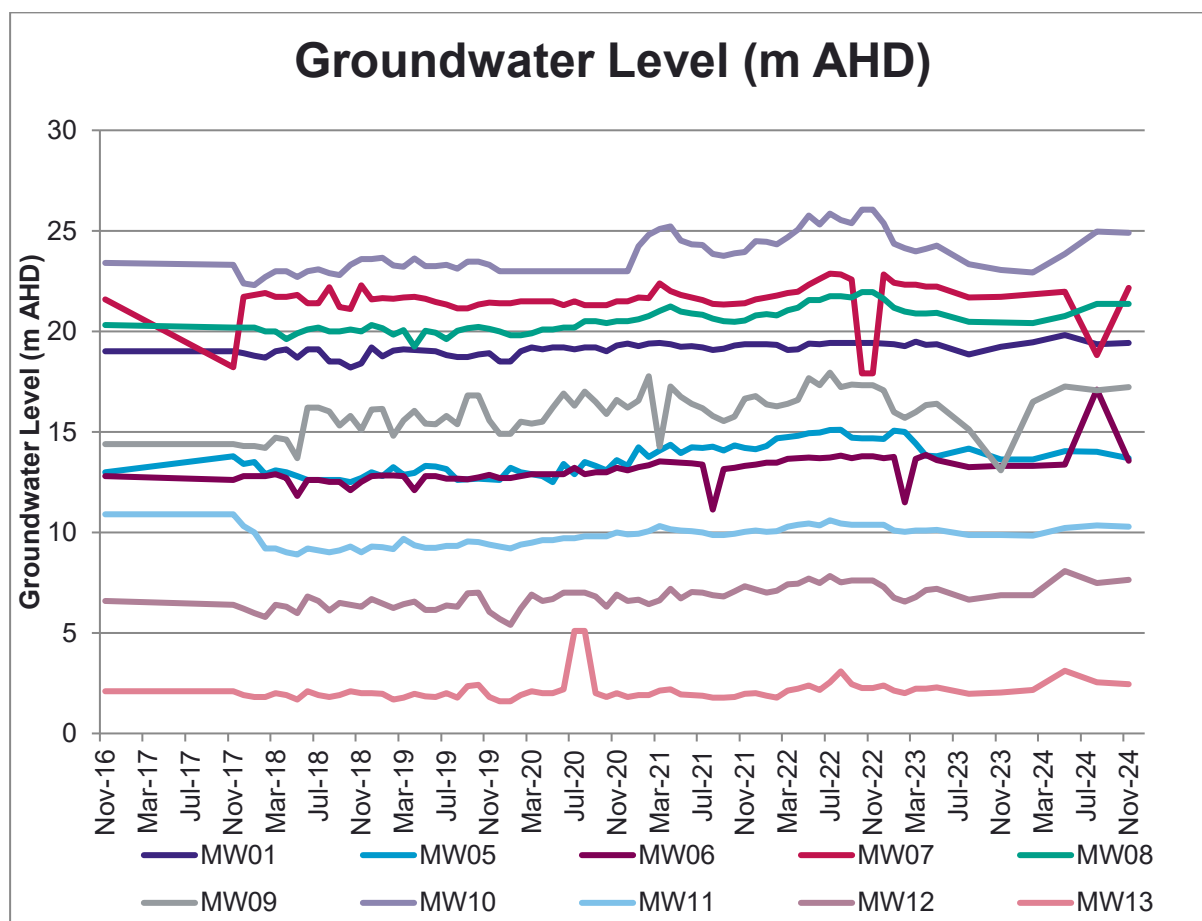
Figure 7-8Groundwater Levels Summary (m AHD)

7.4.5   Implemented / Proposed Improvements

Groundwater management controls are considered effective during the Reporting Period. Myuna will continue to implement the WMP and review or revise this plan in accordance with Schedule 5, Condition 5 of the PA10_0080.

7.5   MANGANESE MONITORING

As per Section 8, Special Condition E1 Additional Monitoring of EPL366, Myuna Colliery must submit a quarterly report to the EPA, detailing the manganese concentration results collected during the surface-water monitoring program as required in condition E1.1. As of February 25, 2022, a trend analysis via graph presenting manganese monitoring results reported in accordance with condition E1 over a rolling 10-year period is to be included. This graph must also include relevant water quality guideline(s) for manganese.

7.5.1   Environmental Management

Four samples are collected quarterly from Wangi Bay at the outlet of Wangi Creek. The results are provided in **Table 7-8** and shown in **Figure 7-9** and **Figure 7-10.**

7.5.2   Environmental Performance

Table 7-8 below shows the quarterly manganese monitoring results for 2024.

Table 7-8: 2024 Manganese Monitoring Results

Location	Unit of	Mar-24	Jun-24	Sep-24	Dec-24	SSGV
T2-5M(1)	mg/L	0.098	0.021	0.019	0.025	
T2-5M(2)	mg/L	0.088	0.036	0.015	0.019	0.66
T2-10M(1)	mg/L	0.026	0	0	0.000	
T2-10M(2)	mg/L	0.035	0	0	0.000	

7.5.3 Comparison Against Predictions

An independent study was completed in 2004 regarding the environmental impact of manganese concentrations into Lake Macquarie from Myuna Colliery. Through this study the Site-Specific Guideline Value (SSGV) of 0.66mg/L was set. In the past 10 years of monitoring this SSGV has not been exceeded.

7.5.4 Long Term Trend

The Manganese monitoring has been conducted from 2011. Manganese concentrations recorded in Wangi Bay over the ten-year period of monitoring display a relatively constant trend at T2 10m and a downward trend at T2 5m. The long-term trend is shown in **Figure 7-9** and **Figure 7-10** below. Note: SSGV of 0.66mg/L is as per the 'Manganese Discharge from the Myuna Colliery ANZECC/ARMCANZ Study, 2004'.
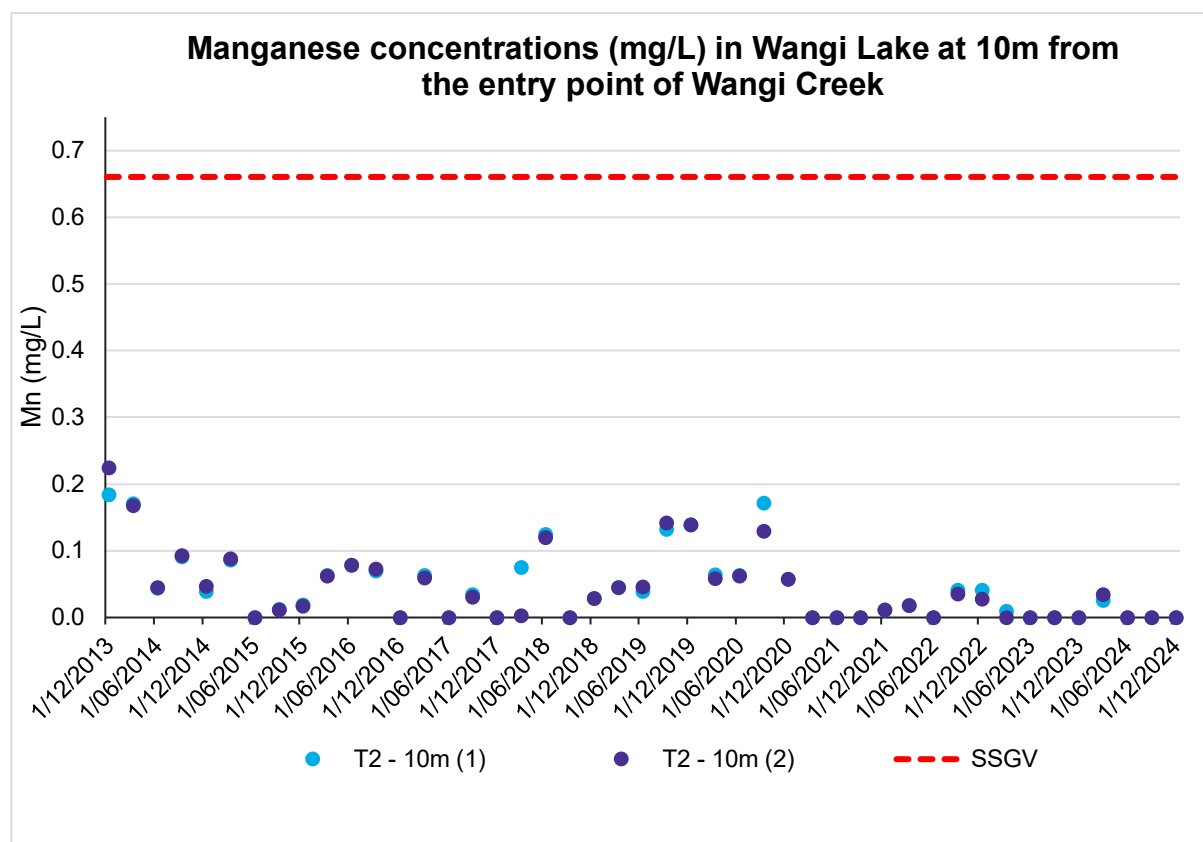
Figure 7-9: Manganese Concentrations (mg/L) Long Term Average (10m)
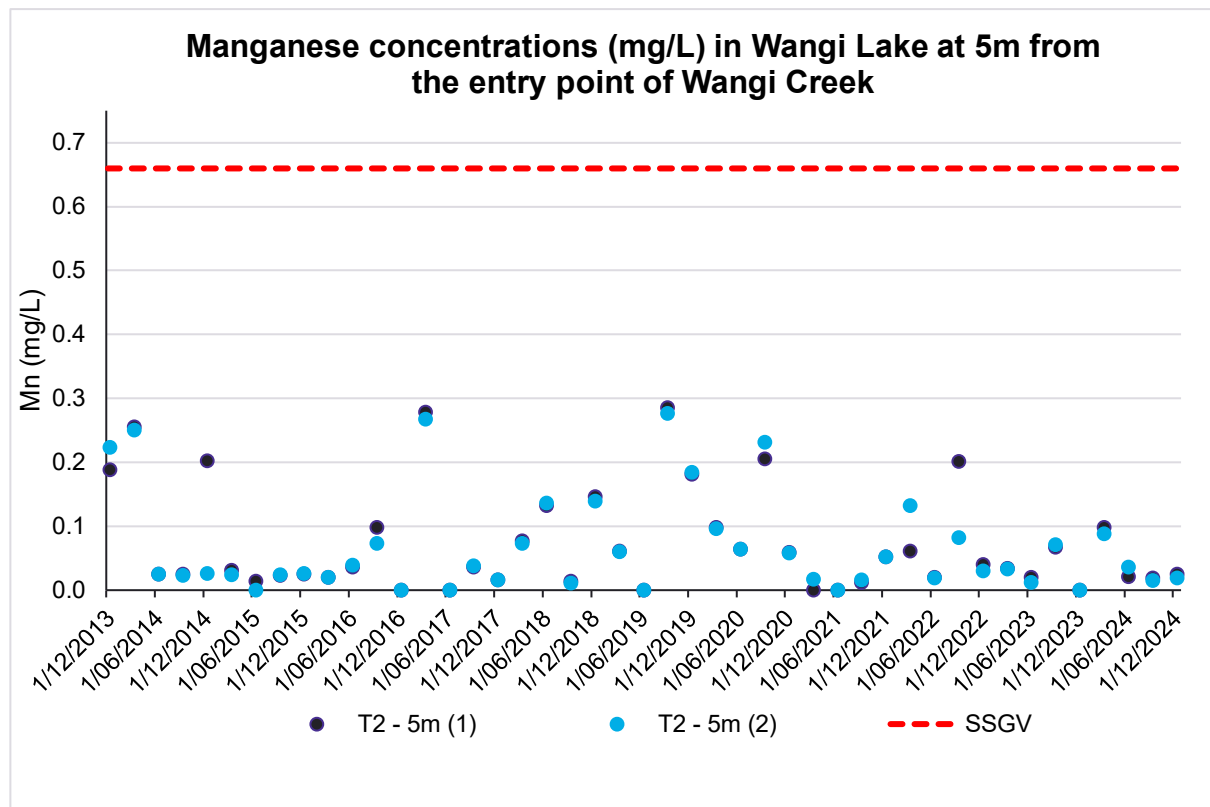
Figure 7-10: Manganese Concentrations (mg/L) Long Term Average (5m)

8   REHABILITATION

Since the 2022 Myuna Annual Review, rehabilitation is presented in the Annual Rehabilitation Report which is submitted to the NSW Resources Regulator (RR) and made available on the Centennial Myuna website. An overview of rehabilitation activities during the report is below.

8.1   REHABILITATION PLANNING ACTIVITIES

The Myuna Rehabilitation Cost Estimate (RCE) was reviewed in 2024 to include items raised by the RR. To accommodate these updates the following rehabilitation activities were conducted:

- A hydrocarbon remediation options assessment was completed by SMEC for the remediation of the decommissioned UST and surrounding contamination.
- Review of demolition waste for transport and disposal.
- Review of surface and sub-surface, pipelines and conveyors.

8.2   SUBSIDENCE REPAIR AND REMEDIATION

There were no subsidence repairs or remediation activities undertaken at the site during the reporting period.

8.3   EXPLORATION

No rehabilitation relating to exploration was completed during 2024.

8.4   REHABILITATION MANAGEMENT AND MAINTENANCE ACTIVITIES

Rehabilitation management and maintenance activities undertaken at the site during the reporting period included:

- Weed management activities were completed on site, these were informed by weekly environmental inspections and Endangered Ecological Community (EEC) condition monitoring of Riparian Melaleuca Swamp Woodland conducted on an annual basis.

9 COMMUNITY CONSULTATION

The Myuna Colliery Community Consultative Committee (CCC) has been established to provide a formal conduit for exchange of information and views between the local community and Myuna's Management Team.

Regular agenda items for the meetings include:

- Progress at the Mine – Operational;
- Monitoring and Environmental Performance;
- Community Complaints and Responses.
- Update on Management Plans & External Audits;
- Information provided to the community and any feedback; and
- Extraction Plans or any other major project.

There were two CCC meetings held in March and October 2024. The Chair and Committee were provided with six monthly updates the operation and performance electronically throughout the report period. Copies of the meeting minutes and presentations are available on the Centennial Myuna website.

9.1 COMMUNITY SPONSORSHIP

Centennial Myuna continues to support the local community through various sponsorship schemes. The following is the sponsorship and support carried out locally to community and sporting groups during the calendar year:

- Wangi Bowling Club;
- Wangi Women's Bowling Club;
- Wangi Wangi Lions Club (Dobell Festival);
- Morisset Meals on Wheels; and
- Wangi Community Fireworks.

9.2 COMMUNITY COMPLAINTS

During the 2024 calendar year reporting period as applicable for this report, there have been no complaints received.

Table 9-1: Record of annual community complaints for 2014 to 2024

Year	Air	Water	Noise	Waste	Other	Total
2024	0	0	0	0	0	0
2023	0	0	0	0	0	0
2022	0	0	0	0	1	1
2021	0	0	0	0	11	11
2020	0	0	0	0	193	193

10 INDEPENDENT ENVIRONMENTAL AUDIT

Centennial Myuna engaged IEMA Environmental Pty Ltd (IEMA) as the independent expert approved by the DPIE to carry out an Independent Environmental Audit (IEA) of Myuna Colliery in accordance with Condition 9, Schedule 5 of Project Approval 10_0080 MOD3.

The audit period was defined as from 7th May 2019 (last date of the previous IEA site inspection) to 20th June 2022 (date of site visit conducted by IEMA Environmental). The Independent Environmental Audit assessed compliance with the PA10_0080 MOD 1, EPL366, Mining Lease 1632, Mining Lease 1370 and Mining Purposes Lease 334. In addition, the audit included a review of the adequacy of the strategies, plans and programs required under the project approval. **Table 10-1** below summarizes the results of the audit.

An Action Plan was developed and submitted to the then Department of Planning, Industry and Environment which describes the corrective actions to be undertaken for each non-compliance and recommendation. The Action Plan has a scheduled completion date for each action. The Audit Report and Action Plan has been published on the Centennial Coal website.

A summary of the audit is shown below in **Table 10-1.** Progress against the action plan is shown in **Table 10-2.** The next Independent Environmental Audit is scheduled for June 2025.

Table 10-1: Independent Environmental Audit Compliance Summary

Compliance Status	PA 10_0080	PA 10_0080 SOC	EPL 366	ML 1632	ML 1370	MPL 334	Total
Compliant	41	8	48	6	5	3	**111**
Not triggered	13	4	12	7	6	5	**47**
Admin Non-Compliance	5	0	4	0	0	0	**9**
Low Non-Compliance	1	0	1	0	0	0	**2**
Medium Non-Compliance	0	0	0	0	0	0	**0**
High Non-Compliance	0	0	0	0	0	0	**0**
Not Verified	0	0	0	0	0	0	**0**
Observation	0	0	0	0	0	0	**0**
Note	3	0	11	1	1	3	**19**
Total	**63**	**12**	**76**	**14**	**12**	**11**	**188**

Table 10-2: Independent Audit Action Plan Update

Item No.	Title Condition No.	Aspect	Compliance/ Recommendations	Action Required	Proposed Completion	Progress
NC REC 1	PA 10_0080 S3 C13	Noise Management Plan	Update Noise Management Plan to ensure consistency with site operations/monitoring undertaken.	Myuna Colliery will revise the Northern Region Noise Management Plan– Appendix B.	31/03/2023	Complete
NC REC 2	EPL 366 M2.3	Water Monitoring	Liaise with the EPA regarding the frequency of monitoring at LDP 9. The daily discharge monitoring is overly onerous for a site that has met water quality criteria in Condition L2.4 for numerous years. These discussions may result in an EPL variation.	Myuna Colliery has submitted a licence variation with the EPA to change the frequency of monitoring at LDP 9.		Complete
NC REC 3	EPL 366 M2.4	Water Monitoring	Request condition M2.4 becomes a 'note' in the next EPL variation as relates to Condition M2.3.	See R2 MYU 2022 IEA as above.		Complete
NC REC 4	EPL 366 M5.1	Automated Weather Station	Any future data loss from the Automatic Weather Station should be reported in the Annual Review and EPL Annual Return, along with details of how the issue has been rectified.	Myuna Colliery will report future data loss from the AWS in the Annual Review and EPL Annual Return with details on how the issue has been rectified. A note will be included in the Monthly Website report concerning data continuity.		n/a
IMP Rec 1	PA 10_0080 schedule 3 condition 13	Noise	IEMA recommends that the external noise consultant undertakes real-time monitoring when doing attended monitoring rather than continuous real-time monitoring at the site	Myuna Colliery will investigate feasibility of external noise consultant undertaking real-time monitoring during attended monitoring		Complete
IMP Rec 2	PA 10_0080 schedule 3 condition 22	Water management	Update the Water Management Plan to include the following: - Additional details explaining that the first flush tank can also discharge to Wangi Creek during overflow conditions. - Revised water schematic and updated figures throughout.	Myuna Colliery will revise the Water Management plan with consideration of the changes noted in IMP REC 2.	31/03/2023	Complete

Item No.	Title Condition No.	Aspect	Compliance/ Recommendations	Action Required	Proposed Completion	Progress
			- Additional column in Table 3-1 to list where water goes to. - Justification of why monitoring of groundwater alluvial bores is no longer required at the site. - Justification of why monitoring of coal seam aquifers not possible - Proposed monitoring changes (monthly to quarterly) based on a high level of compliance for many years. - Inclusion of groundwater trigger values based on the proposed changes to groundwater monitoring. - Review of TARPs and monitoring requirements in relation to alluvial monitoring and reflect current operations.			
IMP Rec 3	PA 10_0080 schedule 3 condition 24	Erosion and sediment control	Undertake minor repair to access tracks to clean water drain around site boundary (near conveyors) following high rainfall (note now complete).	Completed since audit.		Complete
IMP Rec 4	PA 10_0080 schedule 3 condition 24	Erosion and sediment control	Undertake minor reshaping of the waste storage area and laydown additional gravel to improve water flow in periods of heavy rainfall.	Myuna Colliery undertakes ongoing maintenance of the waste sorting area which includes the stabilization of ground with material and drainage improvement works.		Complete
IMP Rec 5	PA 10_0080 schedule 3 condition 27	Water management	Inform NRAR of the breach of Wangi Creek Bed into Myuna Canal. Remediation to Wangi Creek is proposed to be undertaken in consultation with relevant departments and technical experts. Centennial Myuna should then prepare and implement a remediation plan for these works.	Myuna Colliery will prepare and implement a remediation plan for the Wangi Creek breach into the Myuna Canal. Remediation will be undertaken in consultation with relevant departments.	30/06/2023	Complete

Item No.	Title Condition No.	Aspect	Compliance/ Recommendations	Action Required	Proposed Completion	Progress
IMP Rec 6	EPL 366 A2.1	Administrative	Update Plan in next EPL Variation to remove portion of ML 1632 transferred to Chain Valley from premises boundary.	Myuna Colliery will update Plan PC7301, 10/02/2021 to reflect recent changes to ML1632.	31/09/2023	Complete
IMP Rec 7	EPL 366 L5.6	Noise	Request removal of requirement to locate noise monitoring equipment within 1 metre of a dwelling façade when assessing LA1(1minute) noise limits as part of next EPL variation	Myuna Colliery will apply for an EPL variation as per the recommendation of IMP REC 7 and IMP REC 8.		Complete
IMP Rec 8	EPL 366 M4.1	Noise	Liaise with EPA to standardise condition M4.1 (noise monitoring frequency) with other Centennial Operations			Complete

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

During the 2024 calendar year reporting period there was a total of one reportable incidents and non-compliances (excluding community complaints).

Table 11-1 provides a summary of the incidents and non-compliances, including the actions taken by Myuna in response to the incident/non-compliance:

Table 11-1: Incidents and Non-Compliances during the Reporting Period

Compliance	Overview of incident/non-compliance	Description of incident/non-compliance	Actions	Status of Actions
Non-compliance 1	Schedule 3, Condition 10 of MP 10_0080 states that the Proponent must implement the Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Planning Secretary Condition M2.2 of EPL 366 includes a monitoring frequency of monthly	On the 1st of November 2024 the depositional dust gauge DG1 for the monitoring period 2 October 2024 to 1 November 2024 was unable to be analysed as the glass container for the dust gauge was unable to be located. The investigation into the displacement of the dust gauge, is inconclusive. The most probably reason the container for the dust gauge was missing, is due to public interference.	Replaced dust gauge, and investigated the cause of the displacement (inconclusive) Reviewed air quality data for previous 12 months - no non-compliances for past 12-month period. Ongoing inspections and repairs of property boundary fence completed Incident Notification and Incident Report submitted to DPHI on 4 November 2024.	Completed

Table 11-2: Summary of Incidents/Non-compliance and Regulatory Action

Compliance Type	Agency	Number
Incidents / Non-compliance	EPA / DPHI	1
Caution Notices	0	
Warning Letters	0	
Penalty Notices	0	
Prosecutions	0	

12 ACTIVITES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Table 12-1 presents activities that are currently planned for the next reporting period.

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Table 12-1 Forecast Operations for 2025

</div>

Improvement Actions
• Ongoing implementation of Myuna Colliery's management plans • Hazard Reduction Burn with RFS
Management Plan Revisions
• After submission of the Annual Review, a review of the Myuna applicable environmental management plans (EMPs) will be undertaken in accordance with Schedule 5, Condition 2 of PA10_0080. If amendments to an EMPs are considered necessary, the EMPs will be resubmitted to the DPHI for approval as required.
Condition Triggers
• Independent Environmental Audit (June 2022 to June 2025).

APPENDICES

Appendix 1: Checklist of Annual Review Reporting Requirements

This appendix provides a checklist of reporting requirements and performance conditions addressed within the Annual Review

Approval	Condition No.	Requirement	Where addressed in Annual Review
Project Approval 10_0080 MOD3	Schedule 5 Condition 4	By the end of March 2013, and annually thereafter, the Applicant must review the environmental performance of the project to the satisfaction of the Secretary. This review must:	Noted
		(a) describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the next year;	Section 8
		(b) include a comprehensive review of the monitoring results and complaints records of the project over the past calendar year, which includes a comparison of these results against the: • relevant statutory requirements, limits or performance measures/criteria; • requirements of any plan or program required under this approval; • monitoring results of previous years; and • predictions in the EA;	Sections 6 & 7
		(c) identify any non-compliance over the past year, and describe what actions were (or are being) taken to ensure compliance;	Section 11
		(d) identify any trends in the monitoring data over the life of the project;	Section 6 & 7
		(e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and	Section 6 & 7
		(f) describe what measures will be implemented over the next year to improve the environmental performance of the project.	Section 6 & 7

Appendix 2: Annual Compliance Noise Monitoring Report

Annual Compliance Noise Monitoring Report – 2024

Myuna Colliery

Centennial Myuna Pty Ltd

PO Box 1000
Toronto NSW 2283

Prepared by:

SLR Consulting Australia

10 Kings Road, New Lambton NSW 2305,
Australia

SLR Project No.: 630.11620

Client Reference No.: R38

14 January 2025

Revision: v1.0

Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
v1.0	14 January 2025	Patrick Marshall	Martin Davenport	DRAFT

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Centennial Myuna Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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1.0   Introduction

1.1   Background

Centennial Myuna Pty Limited (Myuna) has commissioned SLR Consulting Australia Pty Ltd (SLR) to conduct quarterly night-time noise monitoring for the Myuna Colliery located in Wangi Wangi, New South Wales (NSW) in accordance with the approved Northern Region Noise Management Plan (NMP) dated April 2023.

1.2   Objectives of this Report

The NMP has been prepared in accordance with the requirements of Schedule 3 Conditions 11, 12, 13 and 14 of the Myuna Project Approval (PA) PA10_0080, dated 25 November 2022 (PA 10_0080 MOD3) and Section 3 of the Statement of Conditions contained within the Myuna Colliery Environment Protection Licence (EPL) 366 version dated 13 December 2023 (EPL 366).

On 20 January 2023, the EPAs approved an update to EPL366 to adopt the long-term monitoring program for Myuna Colliery. Noise monitoring will now occur at 4 attended noise monitoring locations. A real time unattended noise logger is utilised during the quarterly noise monitoring to assist in determining the relationship between measured noise levels and estimated site contributions.

The objectives of the noise monitoring programme for 2024 were as follows:

- Conduct operator attended noise surveys at four locations (R1, R3, R5 and R7) surrounding the colliery during the night-time period.

- Quantify all discernible sources of noise within each of the attended noise surveys, including measured and/or estimated contribution and maximum level of individual noise sources.

- Assess the noise emissions of Myuna Colliery and determine compliance with respect to the limits contained in the NMP, PA and EPL366.

1.3   Acoustic Terminology

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

2.0   Noise Criteria

2.1   Project Approvals, EPL and NMP

Noise monitoring at Myuna Colliery was conducted in accordance with the EPL366, PA 10_0080 MOD3 requirements and the NMP. The site specific EPL and PA noise limits for the long-term monitoring program are summarised in Appendix B of the NMP and are reproduced in **Table 1**.

Table 1   Project Approval and EPL Noise Criteria

Location	Night	
	$L_{Aeq(15minute)}$	$L_{A1(1minute)}$
R1	35	45
R3	35	45
R5	39	45
R7	39	45
Note 1: To identify locations, see **Figure 1**.		

In addition, quarterly monitoring is conducted as per the following requirements set out in condition M4.1 of EPL 366:

- Occur at each of the 4 monitoring locations listed in condition L5.1.

- Occur quarterly within the reporting period of the Environment Protection Licence.

- Occur during each night period as defined in the NSW Industrial Noise Policy (EPA2000) for a minimum of 15 minutes.

3.0   Operational Noise Monitoring Methodology

3.1   General Requirements

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672.1 – 2019 Electroacoustics—Sound level meters, AS IEC 60942 2017 Electroacoustics – Sound calibrators and carried current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA.

3.2   Methodology – Operator Attended Noise Measurements

Noise monitoring was conducted in accordance with the NMP.

Operator attended noise measurements were conducted during the night-time period for a minimum of 15 minutes per period at each of the four nominated noise monitoring locations representing the most affected receiver locations, listed in **Table 2** and shown in **Figure 1**.

Table 2   Noise Monitoring Locations

Location	Receiver Type	Address	Monitoring Location MGA Zone 56	
			Easting (m)	Northing (m)
R1	Residence	2 Turrama Street, Wangi Wangi	366858	6340370
R3	Residence	3 Sunset Close, Wangi Wangi	365707	6340844
R5	Residence	93 Donnelly Road, Arcadia Vale	366856	6341338
R7	Residence	63 Donnelly Road, Arcadia Vale	367075	6340970

The objective of the operator attended noise monitoring was to measure the maximum (L_{Amax}) and the $L_{Aeq(15minute)}$ noise level contribution from the Myuna Colliery at the nearest potentially affected receptors to determine the noise contribution of operational activities associated with Myuna Colliery over a 15 minute measurement period. In addition, the operator quantifies and characterises the overall levels of ambient noise in the area (i.e. L_{Amax}, L_{A1}, L_{A10}, L_{A90}, and L_{Aeq}) over the 15 minute measurement interval.

Operator attended noise measurements were conducted using a one-third octave integrating Brüel & Kjær Type 2250L sound level meter (serial number 3003389).

MYUNA COLLIERY
ATTENDED NOISE
MONITORING LOCATIONS

FIGURE 1

3.3 Myuna Colliery Operations

Measurements for the night-time period were conducted during typical operational conditions for the Myuna Colliery. Operational activities on site included the following:

- Coal preparation plant.
- General surface operations i.e. deliveries, vehicle movements etc.
- Ventilation fan, compressors and staff and materials drift haulage.

4.0 Results and Discussion

4.1 Results of Operator Attended Noise Monitoring

Results of the SLR operator attended noise surveys conducted at R1, R3, R5 and R7 throughout 2024 are provided in **Table 3** to **Table 6** respectively.

Ambient noise levels presented include all noise sources such as transport (roads, boats, and aircraft), fauna (insects, frogs, birds, and bats), the natural environment (wind in trees), domestic noises, other industrial operations as well as Myuna Colliery noise emissions.

Meteorological data during the monitoring period was obtained from the onsite Myuna Colliery weather station.

The tables also provide the following information:

- Date and start time.
- Monitoring location.
- Wind velocity (m/s) and temperature (°C) at the measurement location.
- Typical maximum (L_{Amax}) and contributed $L_{Aeq(15minute)}$ noise levels.

4.1.1 Operator Attended Noise Survey Results – Monitoring Location R1

Results of the operator attended noise surveys at R1 are provided in **Table 3**. Monitoring location R1 represents residential receptors located to the southwest of the site in Wangi Wangi.

Table 3   Operator Attended Noise Survey Results – R1

Date/ Start Time/ Weather	Primary Noise Descriptor (dBA re 20 µPa)					Modifying Factors Applicable	Discussion
	LAmax	LA1	LA10	LA90	LAeq		
Quarter 1 21/03/2024 22:35 18°C 9.4 m/s W	67	55	39	35	43	N/A[1]	During the night-time period, the ambient noise environment was dominated by insect noise, road traffic noise, and general animal noise.
Quarter 2 25/06/2024 22:35 12°C 0.1m/s NNE F class	70	62	47	38	49	N/A[1]	During the night-time period, the ambient noise environment was dominated by insect noise, road traffic noise, and animal noise.
Quarter 3 11/09/2024 22:27 17°C 0.2m/s E F class	68	61	46	32	47	N/A[1]	During the night-time period, the ambient noise environment was dominated by insects, and road traffic.
Quarter 4 06/11/2024 22:29 22°C 0.4m/s SE F class	67	53	37	34	42	N/A[1]	During the night-time period, the ambient noise environment was dominated by noise from insects, road traffic, and to a lesser extent Myuna Colliery.
Note 1: N/A = Not Applicable due to non-compliant weather conditions and/or Myuna Colliery being inaudible or significantly below the noise criteria.							

Noise from Myuna Colliery was generally somewhat audible in Quarters 1, 2, 3, and 4 at this location. Myuna Colliery typically became audible during lulls in road traffic and other extraneous noise.

Ambient noise levels at this location are typically dominated by road traffic from Summerhill Drive, insect noise, and to a lesser extent Myuna Colliery.

Other noise sources present include residential noise, urban hum, and birdsong.

4.1.2 Operator Attended Noise Survey Results – Monitoring Location R3

Results of the operator attended noise surveys at R3 are provided in **Table 4**. Monitoring location R3 represents residential receptors located to the west of the site in Wangi Wangi.

Table 4 Operator Attended Noise Survey Results – R3

Date/ Start Time/ Weather	Primary Noise Descriptor (dBA re 20 μPa)					Modifying Factors Applicable	Discussion
	LAmax	LA1	LA10	LA90	LAeq		
Quarter 1 21/03/2024 22:03 18°C 9.2 m/s W	67	62	54	37	50	N/A[1]	During the night-time period, the ambient noise environment was dominated by insect noise, road traffic noise, plane flyovers, and distant sirens.
Quarter 2 25/06/2024 22:12 11°C 0.1m/s W F class	68	62	45	39	49	N/A[1]	During the night-time period, the ambient noise environment was dominated by insect noise, road traffic noise, and local residential mechanical plant noise.
Quarter 3 11/09/2024 22:03 17°C 0.2m/s SE F class	74	62	45	33	49	N/A[1]	During the night-time period, the ambient noise environment was dominated by insects, road traffic, construction, and an aeroplane flyover.
Quarter 4 06/11/2024 22:05 22°C 0.4m/s NNE F class	67	60	50	39	49	N/A[1]	During the night-time period, the ambient noise environment was dominated by noise from insects, road traffic, and to a lesser extent Myuna Colliery.
Note 1: N/A = Not Applicable due to non-compliant weather conditions and/or Myuna Colliery being inaudible or significantly below the noise criteria.							

Noise from Myuna Colliery was inaudible in Quarters 1, 2, and 3 at this location. Myuna Colliery was audible in Quarter 4 during lulls in road traffic and other extraneous noise.

Ambient noise levels at this location are typically dominated by road traffic from Summerhill Drive and Wangi Road, and insect noise.

Other noise sources present include residential noise, urban hum, and aeroplane flyovers.

4.1.3 Operator Attended Noise Survey Results – Monitoring Location R5

Results of the operator attended noise surveys at R5 are provided in **Table 5**. R5 represents residential receptors located in Arcadia Vale to the north-north-east of the site.

Table 5   Operator Attended Noise Survey Results – R5

Date/ Start Time/ Weather	Primary Noise Descriptor (dBA re 20 μPa)					Modifying Factors Applicable	Discussion
	L_{Amax}	L_{A1}	L_{A10}	L_{A90}	L_{Aeq}		
Quarter 1 21/03/2024 23:25 18°C 9.9 m/s W	81	74	51	33	59	N/A[1]	During the night-time period, the ambient noise environment was dominated by insect noise, and road traffic noise.
Quarter 2 25/06/2024 23:22 10°C 1.0m/s NNE F class	82	70	45	34	57	N/A[1]	During the night-time period, the ambient noise environment was dominated by insect noise, and road traffic noise.
Quarter 3 11/09/2024 23:51 17°C 1.2m/s N F class	77	69	45	35	54	N/A[1]	During the night-time period, the ambient noise environment was dominated by insects, road traffic, animals, rain, thunder, and to a lesser extent Myuna Colliery.
Quarter 4 06/11/2024 23:15 21°C 0.3m/s S F class	79	74	49	34	58	N/A[1]	During the night-time period, the ambient noise environment was dominated by noise from insects, road traffic, and to a lesser extent Myuna Colliery.
Note 1: N/A = Not Applicable due to non-compliant weather conditions and/or Myuna Colliery being inaudible or significantly below the noise criteria.							

Noise from Myuna Colliery was generally audible in Quarters 1, 2, 3, and 4 at this location. Myuna Colliery typically became audible during lulls in road traffic and other extraneous noise.

Ambient noise levels at this location are typically dominated by road traffic from Donnelly Road, insect noise, and to a lesser extent Myuna Colliery.

4.1.4 Operator Attended Noise Survey Results – Monitoring Location R7

Results of the operator attended noise surveys at R7 are provided in **Table 6**.

Table 6   Operator Attended Noise Survey Results – R7

Date/ Start Time/ Weather	Primary Noise Descriptor (dBA re 20 μPa)					Modifying Factors Applicable	Discussion
	LAmax	LA1	LA10	LA90	LAeq		
Quarter 1 21/03/2024 23:01 18°C 9.4 m/s W	63	57	39	36	43	N/A[1]	During the night-time period, the ambient noise environment was dominated by insect noise, road traffic noise, and dog barking.
Quarter 2 25/06/2024 23:00 11°C 0.3m/s W F class	65	57	45	36	45	N/A[1]	During the night-time period, the ambient noise environment was dominated by noise from road traffic noise, Myuna Colliery, and to a lesser extent, other industry.
Quarter 2 (remeasure[2]) 01/07/2024 22:18 11°C 1.5m/s WSW F class	65	59	41	38	45		During the night-time period, the ambient noise environment was dominated by noise from road traffic noise, and Myuna Colliery.
Quarter 3 11/09/2024 22:49 17°C 0.4m/s ENE E class	65	57	45	33	45	N/A[1]	During the night-time period, the ambient noise environment was dominated by noise from insects, road traffic, animals, and to a lesser extent Myuna Colliery.
Quarter 4 06/11/2024 22:53 21°C 1.3m/s WSW F class	63	59	48	36	47	N/A[1]	During the night-time period, the ambient noise environment was dominated by noise from insects, road traffic, and to a lesser extent Myuna Colliery.

Note 1:   N/A = Not Applicable due to non-compliant weather conditions and/or Myuna Colliery being inaudible or significantly below the noise criteria.

Note 2:   Noise from Myuna Colliery during the Quarter 2 was estimated to exceed the night-time criteria by 1 dB at this location under applicable meteorological conditions. Notwithstanding measured sigma theta data, it was noted that during the night-time period at the R7 monitoring location very light winds, mostly clear skies and cool temperatures were present. Such conditions are typical of 'non-standard' weather effects including intense temperature inversion conditions in accordance with the NSW Industrial Noise Policy (INP) and may have contributed to the measured exceedance at R7. In accordance with INP methodology further monitoring was conducted at the earliest practical night-time period on Monday 1 July 2024.

Noise from Myuna Colliery was audible in Quarters 1, 2, 3, and 4 at this location. Myuna Colliery typically became audible during lulls in road traffic and other extraneous noise.

Ambient noise levels at this location are typically dominated by road traffic from Donnelly Road, insect noise, and to a lesser extent Myuna Colliery.

Other noise sources present include other industry noise, birdsong, and noise from other animals.

5.0 Performance Assessment

The following provides a summary of the results of the attended noise measurements undertaken at each monitoring location.

In accordance with the NMP and PA, the Myuna Colliery contribution can be estimated or calculated by the operator by noting measurable noise events and their source throughout each 15-minute noise monitoring period.

5.1 Quarter 1 2024

Results of the operator attended noise measurements compared with the relevant noise criteria contained in the PA and EPL for Quarter 1 are given in **Table 7** and **Table 8**.

Table 7 Q1 – Performance Assessment – Operations

Location	Myuna Contribution $L_{Aeq(15minute)}$ dBA	Noise Criteria $L_{Aeq(15minute)}$ dBA	Compliance
	Night	Night	Night
R1	24	35	Y
R3	I/A[1]	35	Y
R5	23	39	Y
R7	23	39	Y
Note 1: I/A – Site was inaudible or indistinguishable during the attended measurement.			

Table 8 Q1 – Performance Assessment – Sleep Disturbance

Location	Myuna Contribution $L_{A1(1minute)}$ dBA	Noise Criteria $L_{A1(1minute)}$ dBA	Compliance
R1	28	45	Y
R3	I/A[1]	45	Y
R5	27	45	Y
R7	39	45	Y
Note 1: I/A – Site was inaudible or indistinguishable during the attended measurement.			

Results of the Quarter 1 assessment show that no non-compliances were recorded throughout the noise monitoring period.

5.2   Quarter 2 2024

The results of the operational noise measurements compared with the relevant noise criteria contained in the PA and EPL for quarter 2 are given in **Table 9** and **Table 10**.

Table 9   Q2 – Performance Assessment – Operations

Location	Myuna Contribution $L_{Aeq(15minute)}$ dBA	Noise Criteria $L_{Aeq(15minute)}$ dBA	Compliance
	Night	Night	Night
R1	34	35	Y
R3	I/A[1]	35	Y
R5	33	39	Y
R7[2]	40	39	N[3]
	38	39	Y
Note 1: I/A – Site was inaudible or indistinguishable during the attended measurement.			
Note 2: An additional measurement was conducted at R7 at the earliest practicable period following the initial measurement during the night-time period of Monday 01 July 2024.			
Note 3: Not considered to be a non-compliance in accordance with Section 11.1.3 of the NSW Industrial Noise Policy.			

Table 10   Q2 – Performance Assessment – Sleep Disturbance

Location	Myuna Contribution $L_{A1(1minute)}$ dBA	Noise Criteria $L_{A1(1minute)}$ dBA	Compliance
R1	35	45	Y
R3	I/A[1]	45	Y
R5	34	45	Y
R7	45	45	Y
R7[2]	43	45	Y
Note 1: I/A – Site was inaudible or indistinguishable during the attended measurement.			
Note 2: An additional measurement was conducted at R7 at the earliest practicable period following the initial measurement during the night-time period of Monday 01 July 2024.			

Results of the Quarter 2 assessment show that noise from Myuna Colliery achieved compliance with the relevant criteria during operator attended monitoring periods at R1, R3, and R5 but exceeded the relevant criteria at R7. Noise from Myuna Colliery exceeded the $L_{Aeq(15minute)}$ by 1 dB.

The meteorological conditions at the time of the measurement were typical of 'non-standard' weather effects including intense temperature inversion conditions in accordance with the NSW Industrial Noise Policy and may have contributed to the measured exceedance at R7. Furthermore measured onsite noise levels at the time do not appear to be significantly different to those measured during previous noise monitoring campaigns.

An additional measurement of the noise from Myuna Colliery was conducted at R7 at the earliest practical night-time period following the initial survey on Monday 1 July 2024 . Results showed that noise from Myuna Colliery were compliant with the relevant criteria during the additional operator attended noise monitoring period at R7.

5.3 Quarter 3 2024

The results of the operational noise measurements compared with the relevant noise criteria contained in the PA and EPL for quarter 3 are given in **Table 11** and **Table 12**.

Table 11 Q3 – Performance Assessment – Operations

Location	Myuna Contribution $L_{Aeq(15minute)}$ dBA	Noise Criteria $L_{Aeq(15minute)}$ dBA	Compliance
	Night	Night	Night
R1	32	35	Y
R3	I/A[1]	35	Y
R5	35	39	Y
R7	33	39	Y
Note 1: I/A – Site was inaudible or indistinguishable during the attended measurement.			

Table 12 Q3 – Performance Assessment – Sleep Disturbance

Location	Myuna Contribution $L_{A1(1minute)}$ dBA	Noise Criteria $L_{A1(1minute)}$ dBA	Compliance
R1	35	45	Y
R3	I/A[1]	45	Y
R5	37	45	Y
R7	37	45	Y
Note 1: I/A – Site was inaudible or indistinguishable during the attended measurement.			

Results of the Quarter 3 assessment show that no non-compliances were recorded throughout the noise monitoring period.

5.4   Quarter 4 2024

The results of the operational noise measurements compared with the relevant noise criteria contained in the PA and EPL for quarter 4 are given in **Table 13** and **Table 14**.

Table 13   Q4 – Performance Assessment – Operations

Location	Myuna Contribution $L_{Aeq(15minute)}$ dBA	Noise Criteria $L_{Aeq(15minute)}$ dBA	Compliance
	Night	Night	Night
R1	32	35	Y
R3	35	35	Y
R5	33	39	Y
R7	33	39	Y
Note 1: I/A – Site was inaudible or indistinguishable during the attended measurement.			

Table 14   Q4 – Performance Assessment – Sleep Disturbance

Location	Myuna Contribution $L_{A1(1minute)}$ dBA	Noise Criteria $L_{A1(1minute)}$ dBA	Compliance
R1	36	45	Y
R3	38	45	Y
R5	35	45	Y
R7	35	45	Y
Note 1: I/A – Site was inaudible or indistinguishable during the attended measurement.			

Results of the Quarter 4 assessment show that no non-compliances were recorded throughout the noise monitoring period.

6.0   Conclusion

Quarterly noise monitoring for the Myuna Colliery has been completed throughout 2024 in accordance with the Norther Region Noise Management Plan short-term and long-term noise monitoring programs.

Operator attended noise monitoring was conducted quarterly in order to determine the noise contributions of Myuna Colliery with the relevant criteria. No non-compliances were recorded throughout any of the noise monitoring periods with the exception of a minor 1 dB exceedance at monitoring location R7 during Quarter 2. An additional measurement of the noise from Myuna Colliery was conducted at R7 at the earliest practical night-time period where results showed that noise from Myuna Colliery were compliant with the relevant criteria during the additional operator attended noise monitoring period at R7.

Myuna Colliery was therefore found to have achieved compliance with the relevant noise criteria during all monitoring periods throughout 2024.

Appendix A   Acoustic Terminology

Quarterly Compliance Noise Monitoring – 4th Quarter 2024

Myuna Colliery

Centennial Myuna Pty Ltd

SLR Project No.: 630.11620

14 January 2025

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3. Sound Power Level

The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.
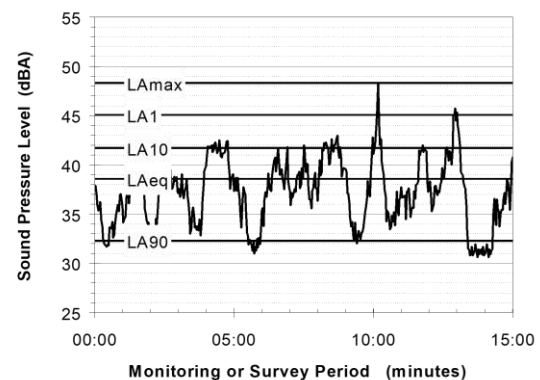
Of particular relevance, are:

LA1   The noise level exceeded for 1% of the 15 minute interval.

LA10   The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90   The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq   The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)

Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.
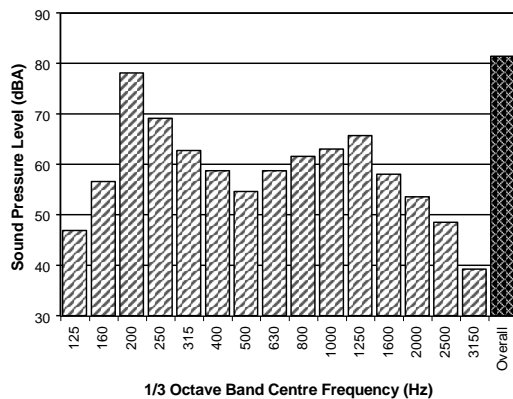
6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

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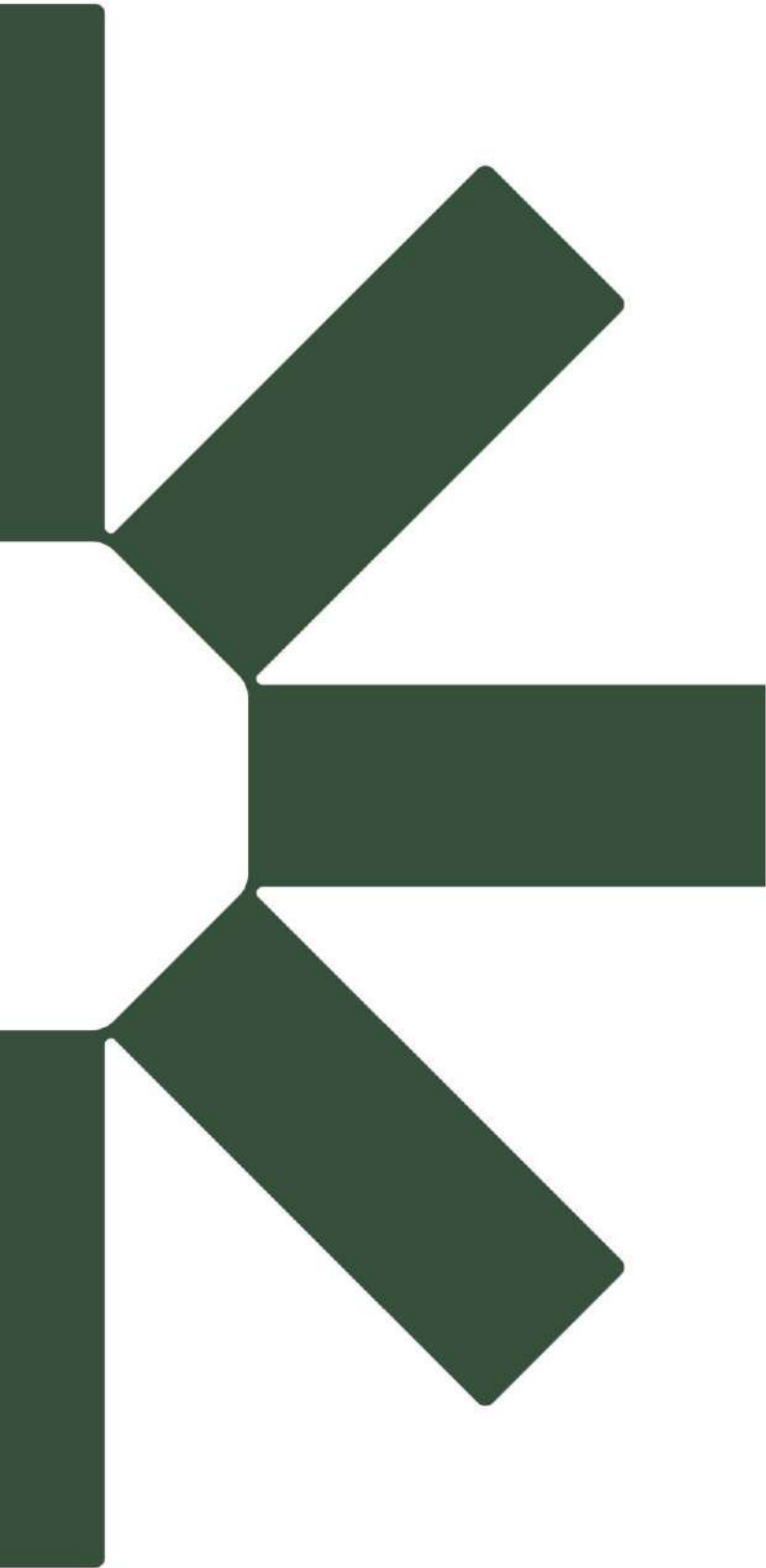
Appendix 3: Annual Ecology Monitoring Report

MYUNA COLLIERY ENDANGERED ECOLOGICAL COMMUNITY MONITORING REPORT

2024 Annual Monitoring

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
D1	Internal review	Brooke Sanders	Chris Wellington	Chris Wellington	13/12/2024

Approval for issue

Chris Wellington   *[signature]*   13 Dec 2024

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1   INTRODUCTION

Centennial Myuna (Centennial) engaged RPS AAP Consulting Pty Ltd (RPS) to undertake the annual monitoring of an Endangered Ecological Community (EEC) at Myuna Colliery as per the requirements specified in the Northern Operations Regional Biodiversity Management Plan (BMP; Centennial Coal 2022) and Myuna Colliery site specific BMP. The monitoring area is shown in **Figure 1-1**.

The consent conditions issued for the approved Myuna Coal – Modification 1 (MP_10-0080 MOD3) requires the annual monitoring of Riparian Melaleuca Swamp Woodland vegetation forming part of the *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* EEC listed under the *Biodiversity Conservation Act 2016* (BC Act). Monitoring specifications are described in the Northern Operations Regional and Myuna Colliery BMPs.

Baseline monitoring was undertaken by Hunter Land Management in 2015. Since then, ongoing monitoring has been carried out by RPS (2016, 2017, 2020, 2021, 2022 and 2023) and Umwelt (2018 and 2019). Initial monitoring methodology was carried out under the BioBanking Assessment Methodology (BBAM), which was made redundant in 2018 and replaced by the Biodiversity Assessment Methodology (BAM). All monitoring data collected after 2018 has occurred in accordance with plot methods specified in the BAM.

1.1   Objective

The annual EEC monitoring program has the purposes of addressing Conditions 28 (c) and (d) of the approved MP_10-0080 MOD3, which are reproduced below for convenience:

Condition 28(c)   have a particular focus on measures that would be implemented over the life of the mine to protect and enhance the Swamp Sclerophyll Forest on Coastal Floodplains endangered ecological community near Wangi Creek, and

Condition 28(d)   include a detailed description of the measures that would be implemented over the life of the mine to ensure that native vegetation and habitat within the surface facilities sites (particularly the Swamp Sclerophyll Forest on Coastal Floodplains endangered ecological community near Wangi Creek) are properly managed, including procedures for:

- weed management (both control and suppression)

- protection and enhancement of native vegetation and habitat

- feral animal control

- fire management (including asset protection zones) and

- management of public access.

The purpose of the monitoring is to determine if there is any measurable change in the health or condition of PCT 1649: *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions* EEC (Swamp Sclerophyll Forest on Coast Floodplains EEC) and *Callistemon linearifolious* (Netted bottlebrush), a species listed as vulnerable under the BC Act. Where change is detected, and is deemed to be a negative change, this monitoring report will inform Centennial of the possible reasons for change and provide recommendation for the management of these changes.

Figure 1-1   Location map

2   METHODOLOGY

2.1   Overview

Monitoring works performed for the 2024 reporting period were undertaken on 29 November 2024 by Miss Jess Graham (Ecologist) and Miss Brooke Sanders (Ecologist). Monitoring was performed in two vegetation management areas (VMAs) reflective of observed health classes (RPS 2016), which are listed below:

- VMA 1: MU42 in moderate/good-high condition and
- VMA 2: MU42 in moderate/good-medium condition.

Details of these monitoring sites along with description of methodology are outlined in the following section.

2.2   Monitoring sites

Sites have been monitored annually since 2015. In 2019, monitoring sites were permanently marked with a star picket at the start and end point of each transect as a recommendation of Umwelt (2018). As mentioned in the 2019 Ecological Monitoring Report (EMP), some alterations were made to ensure all transects were kept within the Vegetation Management Area (VMA). Alterations included slightly adjusting the bearing of the plots in a way that allows transects to remain within the VMA. However, start points of each transect remain in the same location as original placement in 2015.

Umwelt (2018) also recommended increasing the number of photo monitoring points at each monitoring site. Prior to 2018, only three photos were taken, from the north-east corner of the plot, and the start and end of each transect. The new method requires photos to be taken at each corner of the plot, facing inwards, and at the start and end of the transect. For consistency, RPS has conducted the 2024 monitoring in accordance with methods and recommendations provided by Umwelt in previous monitoring efforts.

2.3   Biodiversity Assessment Methodology (BAM)

At each of the three permanent monitoring locations, the BAM was utilised to estimate ecosystem composition, structure, and function to determine the vegetation integrity. The method used to measure these attributes is detailed in (OEH, 2017) and summarised in **Table 2-1**.

Table 2-1   BAM growth forms and attributes

Growth form groups used to assess composition and structure (20 x 20 m plot)	Attributes used to assess function (20 x 50 m plot)
a) Tree	a) Number of large trees
b) Shrub	b) Tree regeneration
c) Grass and grass like	c) Tree stem size class
d) Forb	d) Total length of fallen logs
e) Fern	e) Litter cover (Five 1 m^2 sub-plots)
f) Other	f) High threat exotic vegetation cover
	g) Hollow bearing trees

Biometric plots (20 x 50 m) were established, marking the start and end points of the transect using GPS and permanent pegs. The dimensions of the standard biometric plot are shown in **Figure 2-1**.
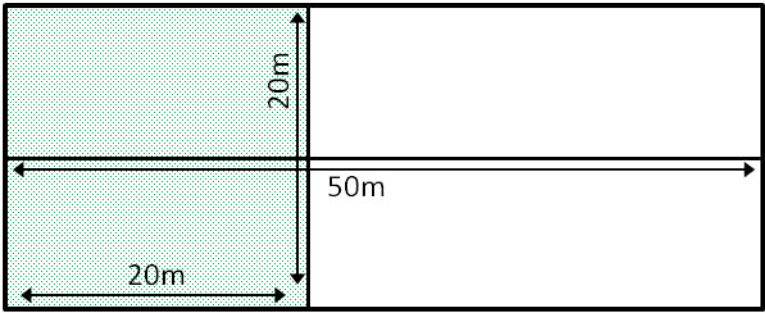
Figure 2-1   Biometric plot dimensions

2.4   Photo monitoring

Photo monitoring was carried out at each of the monitoring sites. Photos were used to identify any observable changes in vegetation condition over time.

Six photos were taken at each monitoring site. One photo at each corner of the 20m x 20m floristic plot, and one photo at the start and end of the transect. All photos are compared to images from 2018 onwards (due to change in methodology) to identify any changes in vegetation condition or landscape variations.

Permanent photo monitoring locations were installed using wooden stakes. During the 2020 monitoring event, photo monitoring locations were re-labelled to reflect their position in relation to the plot. These changes are outlined in **Table 2-2** along with the orientation amendments. The updated orientations of the photo monitoring corners were utilised during the 2024 monitoring event.

Table 2-2   Photo monitoring location orientation amendments

2018	2019	2020 onwards
Plot 1		
North-East Corner	No matching photograph taken	North-east Corner, Matching 2018 photograph location
	Labelled as north-east	South-east Corner
	South-east Corner	South-west Corner
	South-west Corner	North-west Corner
Plot 2		
	North-east Corner	South-east Corner
	North-west Corner	North-east Corner
	South-east Corner	South-west Corner
	South-west Corner	North-west Corner
Plot 3		
	North-east Corner	South-east Corner
	North-west Corner	North-east Corner
	South-east Corner	South-west Corner
	South-west Corner	North-west Corner

2.5   Endangered Ecological Community monitoring

Data collected for composition, structure and function parameters outlined in **Section 2.3** will be compared against benchmark data for the corresponding Plant Community Type (PCT; OEH, 2020). This will be used to assess the condition of the EEC.

2.6 Groundwater Dependent Ecosystem monitoring

The Swamp Sclerophyll Forest on Coastal Floodplains EEC occurring within the site is representative of a ground water dependant ecosystem (GDE; RPS, 2017) and was quantitatively monitored using methods outlined in **Section 2.3**. Data collected for floristic composition, structure and function parameters will be compared against benchmark data for the corresponding PCT. The PCT found throughout this site is 1649 Smooth-barked Apple - Red Mahogany - Swamp Mahogany - *Melaleuca sieberi* heathy swamp woodland of coastal lowlands.

2.7 *Callistemon linearifolious* (Netted Bottlebrush) monitoring

As a continuation of the threatened species monitoring carried out by Umwelt in 2019, nine *Callistemon linearifolious* (*C. linearifolius*) were relocated and a condition score assigned. One individual (150) was unable to be relocated. From 2022, two additional individuals (individuals 159 and 160) were included in the monitoring as per the recommendations from 2021, to allow for more rigorous analysis of condition of the population within the EEC. This monitoring has been continued, where condition scores were allocated via a visual assessment of the individual, and height of the individuals was also recorded. Health categories utilised to assign condition scores to individuals are outlined in **Table 2-3**.

Table 2-3   Visual health assessment categories

Category of Shrub Health	
Healthy	No signs of dieback or leaf loss
Slightly stressed	Minimal dieback through the presence of few small dead branches on otherwise healthy shrubs
Stressed	Reductions in leaf size or leaf loss, discolouration, canopy thinning, or dead branches with some level of die back
Near Dead	Brown leaves, fine branches, and thin canopy
Dead	Absence of leaves, fine branches, or bark

Umwelt, 2019

3 RESULTS

3.1 Weather

A summary of the weather data for the 12-month period preceding the 2024 monitoring event (i.e., November 2023 to October 2024), along with historical monthly data (1862 to 2024; BoM, 2024), is outlined in **Table 3-1.** Long term weather patterns (November 2019 to October 2024) are outlined in **Graph 3-1**. The data was obtained from Newcastle Nobbys Signal Station AWS (61055), located approximately 28km north of the monitoring sites.

Table 3-1   Summary of weather data

Month	Mean maximum monthly temperature (°C)	Mean minimum monthly temperature (°C)	Total monthly rainfall (mm)	Historical mean maximum monthly temperature (°C)	Historical minimum mean monthly temperature (°C)	Historical mean monthly rainfall (mm)
Nov-23	23.1	18.2	116.8	23.5	16.2	71.3
Dec-23	25.5	20	44.2	24.9	18.1	79.1
Jan-24	27	1.4	31.4	25.6	19.3	88.1
Feb-24	26.3	20.9	162.8	25.4	19.4	106.7
Mar-24	25.2	19.8	27.8	24.8	18.3	119.6
Apr-24	23.1	16.3	189.4	22.8	15.4	115.6
May-24	20.1	13.1	316.2	20.1	12	114.5
Jun-24	17.6	10.1	180	17.6	9.8	117.1
Jul-24	17.2	10.2	79.4	16.8	8.5	92.6
Aug-24	20.4	12.6	61.2	18.1	9.3	72.0
Sep-24	21.9	13.2	59	20.3	11.5	71.3
Oct-24	22	15.2	83.8	22.2	14.1	73.0
Total	-	-	**1352**	-	-	**1120.9**

Historical weather data 1862 – 2024

Green = above average statistics

Red = below average statistics

Weather over the 12-month period preceding the 2024 monitoring event was generally above the historical average for both mean maximum monthly temperatures (exceeding November 2023 and October 2023 which were below the average) and mean monthly minimum temperatures (exceeding January 2024 below the average). Rainfall was above the historical average for six months of the year, particularly the three-month period from April to June. The month prior to monitoring also saw rainfall above average and upon inspection of the site in November the study area was visibly flooded.
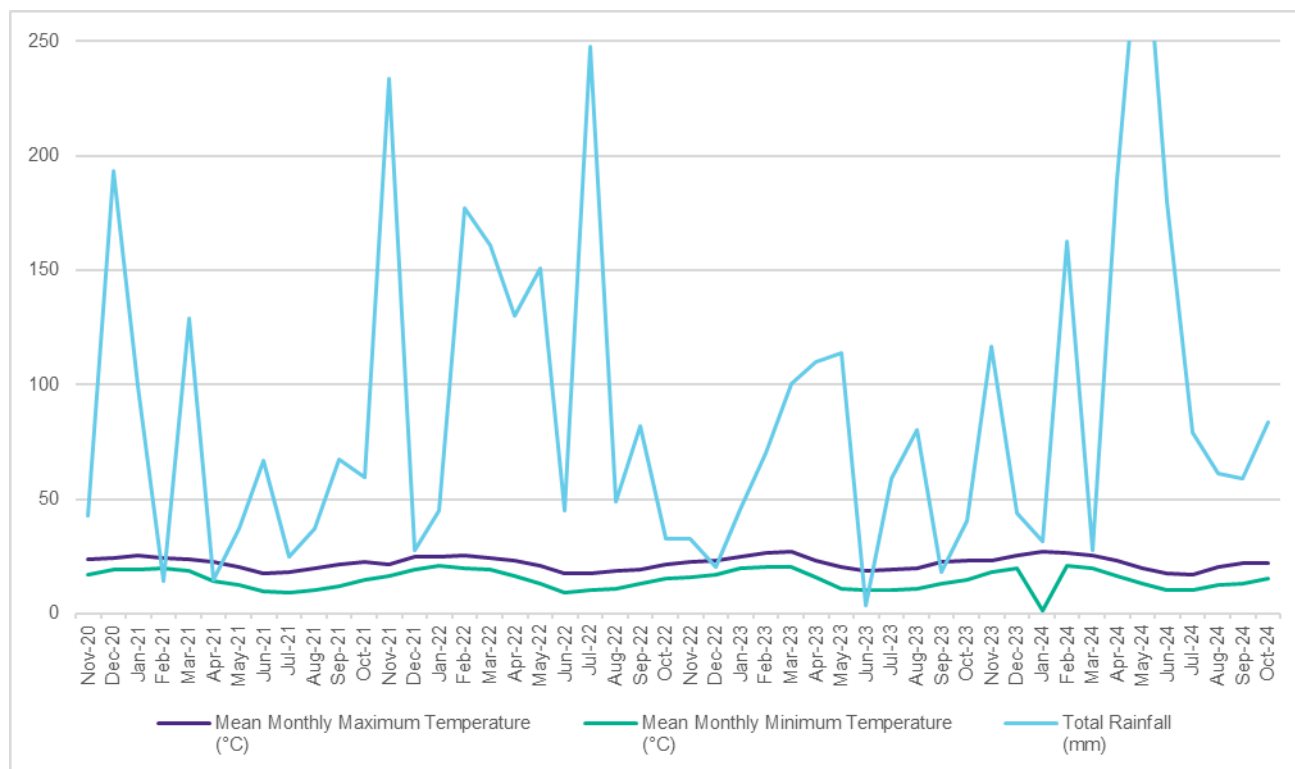
Graph 3-1   Long-term weather patterns (November 2020 to October 2024) preceding the 2024 monitoring event

3.2   Floristic monitoring

Data collected during the 2024 monitoring effort was compared to Umwelt's 2019 and RPS 2020, 2021, 2022 and 2023 data.

To fulfil EEC and GDE monitoring, a comparison of attributes found throughout all plots were to be compared to BAM benchmark conditions. This requires a PCT to be assigned to the vegetation community throughout the site. Umwelt had previously assigned PCT 1649: Smooth-barked Apple - Red Mahogany - Swamp Mahogany - *Melaleuca sieberi* heathy swamp woodland of coastal lowlands to the vegetation community found at both VMA sites. PCT 1649 is present in two IBRA Bioregions, NSW North Coast and Sydney Basin. Benchmarks from the Sydney Basin bioregion were employed. To allow for consistent comparison across years, these PCT benchmarks have been used for the 2024 EEC and GDE data analysis. The location of plots and *C.linearifolius* locations are seen in **Figure 3-1**. below.

Figure 3-1   Location of monitoring sites
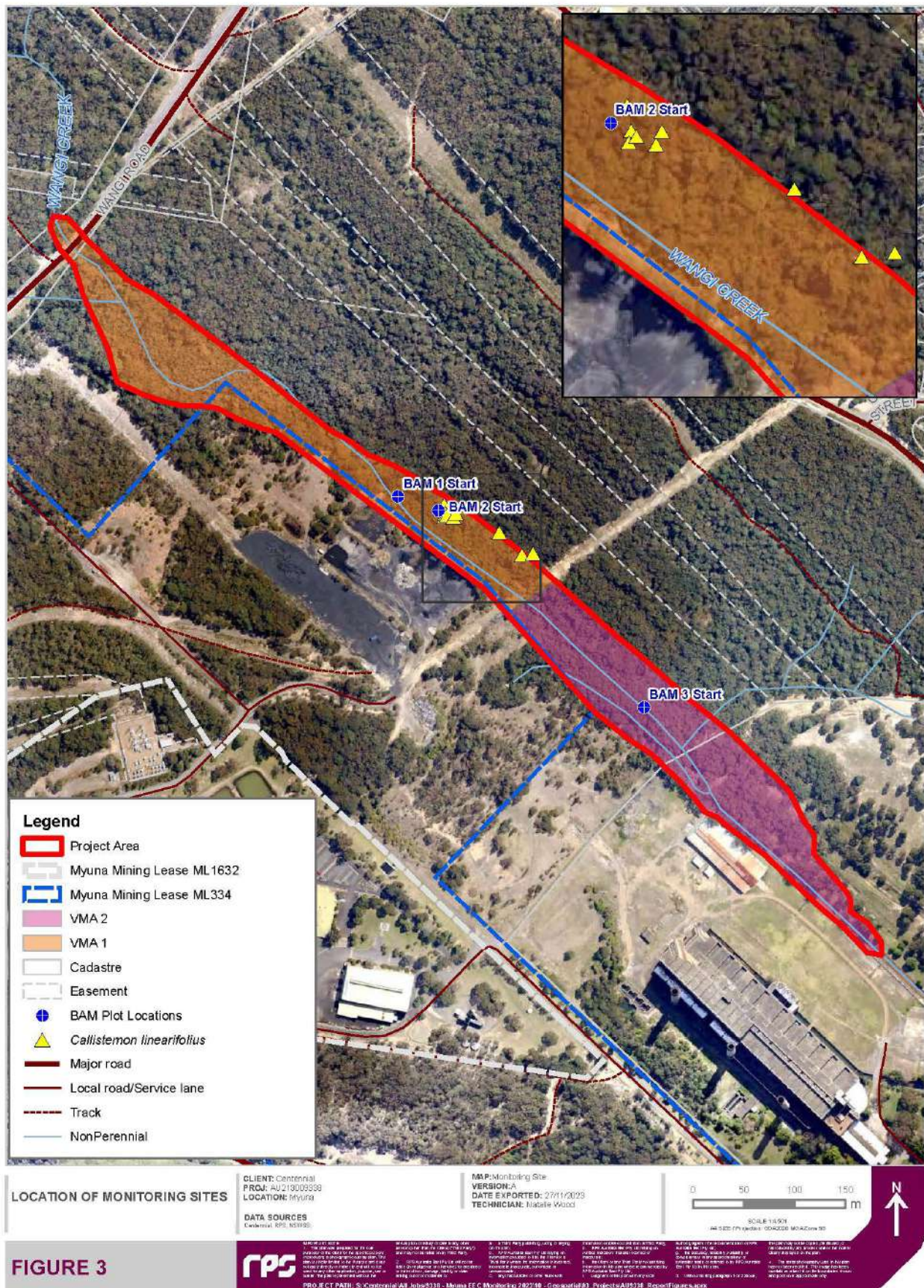
3.2.1 VMA 1

VMA 1 consists of two plots of high condition native vegetation (**Figure 3-1**) . These plots are in locations which have historically experienced relatively high levels of water inundation due to rainfall events. This inundation appeared to be a low energy influx, with minimal deposition of vegetative debris and unconsolidated material. It is important to note that VMA 1 was noticeably flooded during the 2024 monitoring event. The following section reports on data collected from the 2024 monitoring event. There were no visual indicators of mining related activities or impacts (i.e., subsidence or ponding). Evidence of rubbish were present within both monitoring plots in VMA 1.

3.2.1.1 Plot 1

A total of 45 species were recorded, with 37 of these being native (**Table 3-2**). Evidence of rubbish was present within the monitoring plot and visual flooding was observed.

Tree canopy comprises *Eucalyptus robusta* (Swamp Mahogany), *Angophora costata* (Sydney Red Gum), *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum) and *Glochidion ferdinandi* (Cheese Tree) with *E. robusta* being the most dominant canopy species. The shrub layer was dominated by *Melaleuca linariifolia* (Flax-leaved Paperbark) *Pittosporum undulatum* (Sweet Pittosporum) and *Melicope micrococca* (Hairy-leaved Doughwood). Dominant species recorded within the understory include *Gahnia clarkei* (Tall Saw-sedge), *Cymbopogon refractus* (Barbed-wire grass) and *Dianella caerulea var. producta*. Species observed in Plot 1 are provided in **Appendix A.**

Table 3-2   Plot 1 summary statistics – year on year native and introduced flora species richness

Year	Number of native flora species (per cent of total)	Number of introduced flora species (per cent total)	Total number of flora species
2024	**37 (82.2)**	**8 (17.8)**	**45**
2023	35 (85.4)	6 (14.6)	41
2022	33 (82.5)	7 (17.5)	40
2021	37 (82.2)	8 (17.6)	45
2020	29 (76)	9 (24)	38
2019	32 (78)	9 (22)	41
2018	45 (83)	9 (17)	54
2017**	35 (97)	1 (3)	36
2016**	30 (97)	1 (3)	31
2015*	-	-	-
Mean (ex 2024)	**34.5**	**6.3**	**40.8**

* No floristic data collected in 2015 (HLM)

** Floristic data collected according to BBAM (RPS)

A total of eight exotic species were recorded within Plot 1. Three of these exotic species were recorded as High Threat Weeds (HTW) under BAM (OEH, 2017) and one species is listed as a Weed of National Significance (WoNS; Commonwealth of Australia, 2017). The number of high threat weeds present in Plot 1 has declined by 50% from the previous year's monitoring event (from six in 2023 to three in 2024). **Table 3-3** lists exotics species and associated listings.

Table 3-3   Exotic species and associated listings

Scientific name	Common name	WoNS	HTW
Cirsium vulgare	Spear Thistle		
Conyza bonariensis	Flaxleaf Fleabane		
Ehrharta erecta	Panic Veldtgrass		YES
Lantana camara	Lantana	YES	YES
Osteospermum spp.	Stinking Roger		
Poaceae indeterminate			

Scientific name	Common name	WoNS	HTW
Richardia brasiliensis	Mexican Clover		
Tradescantia fluminensis	Wandering Trad		YES

Photographs of Plot 1 at specified monitoring points over the last 4 years are shown in **Table 3-4**.

Table 3-4   Plot 1- photo monitoring points

| 2021 – Transect start | 2022 – Transect start |

| 2023 – Transect start | 2024 – Transect start |

| 2021 – Transect end | 2022 – Transect end |

2023 – Transect end

2024 – Transect end

2021 – North-east corner

2022 - North-east corner

2023 – North-east corner

2024 - North-east corner

2021 – South-west corner

2022 - South-west corner

2023 – South-west corner

2024 - South-west corner

2021 – South-east corner

2022 – South-east corner

2023 – South-east corner

2024 – South-east corner

2021 – North-west corner

2022 – North-west corner

2023 – North-west corner

2024 – North-west corner

A comparison of images captured at the photo monitoring locations displays minimal variation in vegetation composition and structure, with any changes likely to be attributed to seasonal variations, or a change in

camera positioning. The effects of high rainfall and subsequent flooding can be seen within Plot 1 between 2023 and 2024, particularly within the north-west and south-west corners of the plot.

3.2.1.2 Plot 2

A total of 47 species were recorded, with 45 of these being native (**Table 3-5**). The were no visual indicators of mining related activities or impacts (i.e., subsidence or ponding). Evidence of rubbish was present within the monitoring plot and visual flooding was observed.

Tree canopy comprises *Angophora costata* (Sydney Red Gum), and *Eucalyptus robusta* (Swamp Mahogany) were present with less common species including *Allocasuarina torulosa.* (Forest Oak), *Glochidion ferdinandi* (Cheese Tree) *Eucalyptus acmenioides* (White Mahogany), and *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum). *A. costata* and *E. robusta* are the most dominant canopy species. The shrub layer was dominated by *Leptospermum polygalifolium* (Tantoon), *Bursaria spinulosa* (Native Blackthorn), and *Pittosporum undulatum* (Sweet Pittosporum)*.* Dominant species recorded within the understory include *Gahnia clarkei* (Tall Saw-sedge)*, Entolasia stricta* (Wiry Panic), *Pteridium esculentum* (Bracken fern) and *Dianella caerulea var. producta*. Species observed in Plot 2 are provided in **Appendix A.**

Table 3-5   Plot 2 summary statistics – year on year native and introduced flora species richness

Year	Number of native flora species (per cent of total)	Number of introduced flora species (per cent total)	Total number of flora species
2024	**45 (96)**	**2 (4)**	**47**
2023	43 (93.5)	3 (6.5)	46
2022	39 (89.7)	4 (10.3)	39
2021	46 (93.9)	3 (6.1)	49
2020	45 (96)	2 (4.3)	47
2019	32 (82)	7 (18)	39
2018	39 (93)	3 (7)	42
2017**	36 (90)	4 (10)	40
2016**	30 (81)	1 (3)	37
2015*	-	-	-
Mean (ex 2024)	**38.3**	**3.4**	**42.4**

* No floristic data collected in 2015 (HLM)

** Floristic data collected according to BBAM (RPS)

One exotic species was recorded within Plot 2. **Table 3-6** lists exotics species and associated listings. *Lantana camara* is listed as a WoNS (Commonwealth of Australia, 2017) and is also listed as a priority weed in the Hunter Local Land Services Region (New South Wales Government, 2022) under the *Biosecurity Act 2017*. Plot 2 experienced a decrease in weed species from a count of three in 2023 to one in 2024.

Table 3-6   Exotic species and associated listing

Scientific Name	Common Name	WoNS	HTW
Lantana camara	Lantana	YES	YES

Photographs of Plot 2 at specified monitoring points over the last 3 years are shown in **Table 3-7.**

Table 3-7   Plot 2- photo monitoring points

| 2021 – Transect start | 2022 – Transect start |

| 2023 – Transect start | 2024 – Transect start |

| 2021 – Transect end | 2022 – Transect end |

2023 – Transect end

2024 – Transect end

2021 – North-east corner

2022 - North-east corner

2023 – North-east corner

2024 - North-east corner

2021 – South-west corner

2022 - South-west corner

2023 – South-west corner

2024 - South-west corner

2021 – South-east corner

2022 – South-east corner

2023 – South-east corner

2024 – South-east corner

2021 – North-west corner

2022 – North-west corner

2023 – North-west corner

2024 – North-west corner

A comparison of images captured at the photo monitoring locations displays minimal variation in vegetation composition and structure, with any changes likely to be attributed to seasonal variations, or a change in camera positioning.

3.2.2   VMA 2

VMA 2 consisted of one plot (Plot 3) of medium condition vegetation (**Figure 3-1)**. The were no visual indicators of mining related activities or impacts (i.e., subsidence or ponding). Evidence of rubbish was present adjacent the monitoring plot.

3.2.2.1 Plot 3

A total of 37 species were recorded, with 29 of these being native. These results are consistent with the 2023 monitoring period showing stability in species richness between the two years.

Tree canopy comprises *Eucalyptus robusta* (Swamp Mahogany) and *Glochidion ferdinandi* (Cheese Tree). The shrub layer was dominated by *Ficus coronate* (Creek Sandpaper Fig), *Hymenosporum flavum* (Native Frangipani), *Melaleuca linariifolia* (Flax-leaved Paperbark), and *Pittosporum undulatum* (Sweet Pittosporum), Dominant species recorded within the understory include *Calochlaena dubia (Rainbow Fern), Gahnia clarkei* (Tall Saw-sedge), *Pteridium esculentum* (Bracken Fern) and *Lastreopsis decomposita* (Trim Shield Fernand). Species observed in Plot 3 are provided in **Appendix A**.

Table 3-8   Plot 3 summary statistics – year on year native and introduced flora species richness

Year	Number of native flora species (per cent of total)	Number of introduced flora species (per cent total)	Total number of flora species
2024	**30 (81.1)**	**7 (18.9)**	**37**
2023	29 (78.4)	8 (21.6)	37
2022	27 (77.1)	8 (22.9)	35
2021	30 (71.4)	12 (28.6)	42
2020	26 (68)	12 (31.6)	38
2019	25 (78)	7 (22)	32
2018	22 (65)	11 (32)	34
2017**	22 (73)	8 (27)	30
2016**	23 (72)	9 (28)	32
2015*	-	-	-
Mean (ex 2024)	**25.5**	**9.4**	**35**

* No floristic data collected in 2015 (HLM)

** Floristic data collected according to BBAM (RPS)

A total of seven exotic species were recorded within Plot 3. Three of these exotic species are HTW under BAM (OEH, 2017). **Table 3-9** lists exotics species and associated listings. *Lantana camara* (Lantana) is listed as a WoNS (Commonwealth of Australia, 2017) and are also listed as a priority weed in the Hunter Local Land Services Region (New South Wales Government, 2022) under the *Biosecurity Act* 2017. The number of exotic species identified within Plot 3 has decreased stable since 2023.

Table 3-9   Exotic species and associated listing

Species name	Common name	WoNS	HTW
Cirsium vulgare	Spear Thistle		
Ehrharta erecta	Panic Veldtgrass		YES
Lantana camara	Lantana	YES	YES
Sida rhombifolia	Paddy's Lucerne		
Tradescantia fluminensis	Wandering Trad		YES
Trifolium repens	White Clover		
Viburnum spp.			

Photographs of Plot 3 at specified monitoring points over the last 3 years are shown in **Table 3-10.**

Table 3-10   Plot 3 - photo monitoring points

| 2021 – Transect start | 2022 – Transect start |

| 2023 – Transect start | 2024 – Transect start |

| 2021 – Transect end | 2022 – Transect end |

2023 – Transect end

2024 – Transect end

2021 – North-east corner

2022 - North-east corner

2023 – North-east corner

2024 - North-east corner

2021 – South-west corner

2022 - South-west corner

2023 – South-west corner

2024 - South-west corner

2021 – South-east corner

2022 – South-east corner

| 2023 – South-east corner | 2024 – South-east corner |

| 2021 – North-west corner | 2022 – North-west corner |

| 2023 – North-west corner | 2024 – North-west corner |

A comparison of images captured at the photo monitoring locations displays minimal variation in vegetation composition and structure, with any changes likely to be attributed to seasonal variations.

3.3 Endangered Ecological Community and Groundwater Dependant Ecosystem

A comparison of data collected since 2018 against PCT 1649 benchmarks are outlined in **Table 3-11.** Green indicates above the benchmark, red is below the benchmark and orange is equal to the benchmark.

Table 3-11   Comparison of habitat attributes against PCT benchmark

Attribute	Benchmark	2018	2019	2020	2021	2022	2023	2024
VMA 1								
Composition								
Tree richness	4	5	5	5	4	5	5	6
Shrub richness	9	13	14	11	12	9	10	14
Grass & grass-like richness	7	8	11	7	9	8	8	6
Forb richness	6	8	7	8	5	5	8	8
Fern richness	2	3	3	2	4	3	3	4
Other richness	5	6	8	6	9	6	6	4
Exotic Richness	NA	6	10	6	6	6	5	6
High Threat Weed Richness	NA	3	8	4	1	2	2	2
Structure								
Tree cover	27	75	33	35	30	39	30	38
Shrub cover	19	63	74	39	37	35	31	29
Grass & grass-like cover	51	91	57	36	35	51	42	67
Forb cover	3	9	1	1	1	4	1	3
Fern cover	2	16	0	0	1	1	0	4
Other cover	3	8	1	1	2	2	1	3
Function								
Total length of fallen logs	44	9	27	18	26	1	15	42
Litter cover	44	81	84	67	60	69	71	59
No. of large trees (per 0.1ha)	5	0	0	1	0	1	1	5

Attribute	Benchmark	2018	2019	2020	2021	2022	2023	2024
VMA 2								
Composition								
Tree richness	4	2	2	2	2	2	2	2
Shrub richness	9	7	6	5	6	5	5	9
Grass & grass-like richness	7	4	4	7	4	6	3	5
Forb richness	6	7	6	7	9	8	6	6
Fern richness	2	1	2	1	4	1	4	2
Other richness	5	1	5	4	5	5	9	4
Exotic Richness	NA	11	7	12	12	8	8	8
High Threat Weed Richness	NA	4	4	4	3	2	4	3
Structure								
Tree cover	27	65	40	51	41	32	32	54
Shrub cover	19	38	31	32	17	24	23	54
Grass & grass-like cover	51	71	40	11	6	34	6	8
Forb cover	3	3	1	2	4	9	1	3
Fern cover	2	1	0	0	1	4	1	6
Other cover	3	1	0.6	1	1	6	7	51
Function								
Total length of fallen logs	44	27	41	51	35	8	38	16
Litter cover	44	84	43	98	72	71	71	86
No. of large trees (per 0.1ha)	5	0	5	3	1	8	7	10

Green = above benchmark, Red = below benchmark, Orange = equal to benchmark

Results from Plots 1 and 2 in VMA 1 were averaged to compare with Plot 3 found in VMA 2. In VMA 1, three of the fifteen indicators were below the benchmark and three were equal to the benchmark value. Overall, results for VMA 1 were largely above the PCT benchmark, with the exception of grass and grass like richness, other richness, forb and other cover and the total length of fallen logs. Forb cover and other cover were repeated triggers from 2023, however the overall number of triggers below the baseline has decreased from the previous year's monitoring event. Exotic richness in VMA 1 increased by a count of one since 2023 and the number of high threat weeds has remained stable at a count of two since 2022.

Results from VMA 2 were varied, with five out of 15 of the indicators below the PCT benchmark and four indicators equal to the benchmark. The indicators which fell below benchmark were tree, forb, grass & grass-like and other richness, grass & grass-like cover and total length of fallen logs. Tree and shrub richness has remained below or equal to the benchmark since the commencement of monitoring in 2018, however tree and shrub cover values have remained above the benchmark every year from 2022. Since 2019 reductions were observed in grass and grass-like cover and richness, with the current monitoring period showing a continuing trend of decline. Alternatively, fern cover has substantially increased from 1% 2023 to 6% in 2024 with fern richness equal to the benchmark. Exotic species richness has remained the same since 2023, however the high threat weeds have declined.

3.4 *Callistemon linearifolius* (Netted Bottlebrush) monitoring

A comparison of the health of *C. linearifolius* is outlined in **Table 3-12**. A total of ten *C. linearifolius* were assessed in this monitoring period. Individuals appeared to have been impacted by heavy water flow during the 2020 monitoring event, with some individuals having broken branches resulting from the accumulation of debris around their stems. Two individuals, namely 151 and 152 located within the riparian zone were still observed to have broken branches during the 2024 monitoring event. Four out of ten individuals surveyed in 2024 recorded signs of no change in condition from the previous year. The other six individuals showed a decline in condition from the previous year.

Table 3-12 *C. linearifolius* height and condition

Plant I.D.	2019 Height (m)	2019 Condition	2020 Height (m)	2020 Condition	2021 Height (m)	2021 Condition	2022 Height (m)	2022 Condition	2023 Height (m)	2023 Condition	2024 Height (m)	2024 Condition
150	2.3	Healthy	-	-	-	-	-	-	-	-	-	-
151	2.15	Healthy	2.3	Slightly stressed*	2.3	Slightly Stressed*	2.2	Slightly stressed**	2.1	Slightly stressed*	2.2	Slightly stressed*
152	1.7	Healthy	1.7	Slightly stressed*	1.7	Slightly Stressed*	1.6	Stressed**	1.6	Stressed**	1.6	Stressed*
153	1.03	Healthy	1.0	Slightly stressed*	1.0	Healthy	1.1	Healthy	1.1	Stressed**	1.0	Stressed
154	0.45	Healthy	0.9	Slightly stressed**	0.9	Healthy	1.2	Healthy	1.0	Slightly Stressed**	1.0	Stressed
155	1.9	Healthy	2.3	Healthy	2.3	Healthy	2.2	Healthy	2.4	Healthy	2.2	Healthy
156	1.12	Slightly stressed	2.0	Slightly stressed	2.0	Slightly Stressed	1.8	Slightly stressed**	2.0	Slightly stressed**	2.0	Slightly stressed **
157	2.0	Healthy	2.0	Slightly stressed**	2.0	Healthy	-	Unable to be located	2.1	Healthy	2.3	Slightly stressed
158	1.72	Healthy	1.6	Healthy	1.6	Healthy	1.9	Slightly stressed**	1.8	Healthy	1.9	Slightly stressed
159	-	-	-	-	-	-	1.6	Healthy	1.8	Healthy	2.2	Slightly stressed
160	-	-	-	-	-	-	2.0	Healthy	2.0	Healthy	1.8	Slightly stressed

*Broken stem, **Browning leaves/dieback. Red indicates decline in condition, Green indicates no change, or increased condition.

Additional morphological and reproductive attributes (i.e., leaf growth, presence of flowers or fruit) were recorded to assess the condition of *C. linearifolius*. These attributes are outlined in **Table 3-13**.

New leaf growth and signs of old fruit was observed on three individuals. Old flowers were observed on two individuals during the monitoring event, however there were no new flowers. Old fruit/seeds were observed on three individuals.

Table 3-13   Additional condition assessment attributes

Plant I.D.	New leaf growth (Y/N)	Flowers (Y/N)	Fruit (Y/N)
151	Y	N	Y
152	N	N	Y
153	N	N	N
154	N	N	N
155	Y	N	N
156	N	N	N
157	Y	N	Y
158	N	N	N
159	N	N	N
160	N	N	N

4   DISCUSSION

Section 3 of this report presents the results from the 2024 EEC monitoring event for comparison with data collected by Umwelt in 2018 and 2019 and RPS from 2020 onwards. Data collected prior to the Umwelt 2018 and 2019 monitoring events was collected under BBAM and was therefore not directly comparable.

Plots 1 and 2 of VMA1 recorded mean species richness which were above the average as well as an increase in the number native flora species since the previous year's monitoring event. The proportion of high threat weed species declined in VMA 1 from 2023 to 2024, however exotic species richness increased in Plot 1 and remained stable in Plot 2. Averaged results from plots within VMA 1 were above or equal to the PCT benchmark for habitat structure, with ecosystem function having mixed results and all but two attributes being above baseline for species composition. In comparison to the 2023 monitoring results, there was a slight improvement in habitat structure and ecosystem function, however species composition saw a decline. Of the six results equal to or below baseline recorded in VMA 1, four of these were repeated for habitat structure and ecosystem function. High variability in the total count of fallen logs is likely due to flooding events seen throughout the monitoring period.

VMA 2 (Plot 3) recorded the second highest native species count (above average) and highest proportion of native species since the commencement of monitoring in 2015. These results are consistent with the 2023 monitoring period, showing stability in native species richness between the two years. The number of exotic species within VMA 2 has been constant since 2023, however the number of high threat weeds declined since the previous monitoring period. Within VMA 2, species composition saw an overall decline from the 2023 results with all attributes recording results consistent with or below the baseline. On the contrary, habitat structure saw an improvement from the previous year's results and ecosystem function maintained the same results as 2023. VMA 2 exhibited nine triggers, in comparison to VMA 1 recording six triggers. A similar trend is seen for exotic species presence, with far higher presence in VMA 2. These results are likely a consequence of the initial condition of the plot and subsequent management over time.

The presence of rubbish was observed within or adjacent to all three flora monitoring plots, which may be a factor contributing to the introduction of exotic seed and the proliferation of weed species throughout the study area.

Variations in species composition and habitat structure could be influenced by several variables including:

- High water flow moving vegetative material and sediments throughout the creek line, transporting potential weed propagative material and removing lower stratum habitat features and vegetation

- Seasonal variation in weather patterns influencing the occurrence of some species and

- Potential minor variations in plot location (particularly at the edges of the plots).

The condition of *C.linearifolius* continued to slightly decline this monitoring period, with the 2024 results reflecting only one individual to be in healthy condition and five of the ten individuals experiencing a decrease in condition from the previous year. This continual trend of decline has been consistent since 2020, being related to the heavy water flow experienced within the riparian zone where most individuals occur. During the 2024 monitoring event, signs of stabilisation for five individuals were present which maintained the same condition score as the previous year.

Results from the 2024 EEC monitoring indicate no immediate impacts of concern on PCT 1649: *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions* EEC from mining related activities. Floristic data and comparisons of habitat attributes have remained relatively consistent with prior monitoring events, with any slight variations likely attributed to variability in precipitation and climatic factors unrelated to mining operations.

4.1   Recommendations

The incursion of exotic species is evident in both VMAs and has the potential to negatively impact the overall condition of the EEC. Of most concern is VMA 1, which currently is regarded to be in 'high' condition. VMA 2 has constantly fallen below PCT benchmark and recorded higher levels of exotic species since the commencement of monitoring. As this VMA is only regarded as 'moderate' condition, resilience to weed incursion and associated impacts is not as high. The observed increase in exotic species percentage cover over time indicates that weed species recruitment in these VMAs will continue if not appropriately managed.

Ongoing monitoring and appropriate management must continue to be implemented to ensure weed species recruitment in these VMAs does not persist in the future.

The following recommendations aim to maintain the integrity of the EEC and improve study design and repeatability:

- It is recommended that ongoing weed management plan occur, with primary focus on those species that have the highest percent cover of the plot and are listed as high threat weeds. Species lists outlining target species can be found in **Table 3-3**, **Table 3-6**, **Table 3-9** and **Appendix A**.

- Removal of rubbish dumped within or adjacent to the VMAs in order to discourage further illegal dumping.

5   REFERENCES

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Appendix A Species list

Apx Table 1 Species List

Scientific name	Common name	Exotic	Family	BC Act	EPBC Act	BAM growth form group
Acacia longifolia			Fabaceae (Mimosoideae)	-	-	Shrub (SG)
Acacia spp.	Wattle		Fabaceae (Mimosoideae)	-	-	Shrub (SG)
Alchornea ilicifolia	Native Holly		Euphorbiaceae	-	-	Shrub (SG)
Allocasuarina torulosa	Forest Oak		Casuarinaceae	-	-	Tree (TG)
Alyxia spp.			Apocynaceae	-	-	Shrub (SG)
Angophora costata	Sydney Red Gum		Myrtaceae	-	-	Tree (TG)
Banksia spinulosa	Hairpin Banksia		Proteaceae	-	-	Shrub (SG)
Blechnum nudum	Fishbone Water Fern		Blechnaceae	-	-	Fern (EG)
Breynia oblongifolia	Coffee Bush		Phyllanthaceae	-	-	Shrub (SG)
Bursaria spinosa	Native Blackthorn		Pittosporaceae	-	-	Shrub (SG)
Callistemon linearifolius	Netted Bottle Brush		Myrtaceae	V	-	Shrub (SG)
Calochlaena dubia	Rainbow Fern		Dicksoniaceae	-	-	Other (OG)
Carex spp.			Cyperaceae	-	-	Grass & grasslike (GG)
Centella asiatica	Indian Pennywort		Apiaceae	-	-	Forb (FG)
Cirsium vulgare	Spear Thistle	*	Asteraceae	-	-	
Clematis aristata	Old Man's Beard		Ranunculaceae	-	-	Other (OG)
Commelina spp.			Commelinaceae	-	-	Forb (FG)
Conyza bonariensis	Flaxleaf Fleabane	*	Asteraceae	-	-	
Cymbidium spp.			Orchidaceae	-	-	Other (OG)
Cymbopogon refractus	Barbed Wire Grass		Poaceae	-	-	Grass & grasslike (GG)
Dampiera stricta			Goodeniaceae	-	-	Forb (FG)
Desmodium varians			Fabaceae (Faboideae)	-	-	
Dianella caerulea var. producta			Asphodelaceae	-	-	Forb (FG)
Dichondra repens	Kidney Weed		Convolvulaceae	-	-	Forb (FG)
Ehrharta erecta	Panic Veldtgrass	*	Poaceae	-	-	

Scientific name	Common name	Exotic	Family	BC Act	EPBC Act	BAM growth form group
Entolasia marginata	Bordered Panic		Poaceae	-	-	Grass & grasslike (GG)
Entolasia stricta	Wiry Panic		Poaceae	-	-	Grass & grasslike (GG)
Eucalyptus acmenioides	White Mahogany		Myrtaceae	-	-	Tree (TG)
Eucalyptus robusta	Swamp Mahogany		Myrtaceae	-	-	Tree (TG)
Eucalyptus sclerophylla	Hard-leaved Scribbly Gum		Myrtaceae	-	-	Tree (TG)
Eupomatia laurina	Bolwarra		Eupomatiaceae	-	-	Shrub (SG)
Ficus coronata	Creek Sandpaper Fig		Moraceae	-	-	Shrub (SG)
Gahnia clarkei	Tall Saw-sedge	*	Cyperaceae	-	-	Grass & grasslike (GG)
Geitonoplesium cymosum	Scrambling Lily		Luzuriagaceae	-	-	Other (OG)
Gleichenia spp.			Gleicheniaceae	-	-	Fern (EG)
Glochidion ferdinandi	Cheese Tree		Phyllanthaceae	-	-	Tree (TG)
Glochidion ferdinandii	Cheese Tree		Phyllanthaceae	-	-	Tree (TG)
Gonocarpus teucrioides	Germander Raspwort	*	Haloragaceae	-	-	Forb (FG)
Goodenia hederacea	Ivy Goodenia		Goodeniaceae	-	-	Forb (FG)
Hibbertia aspera	Rough Guinea Flower		Dilleniaceae	-	-	Shrub (SG)
Homalanthus populifolius			Euphorbiaceae	-	-	Shrub (SG)
Hymenosporum flavum	Native Frangipani		Pittosporaceae	-	-	Shrub (SG)
Juncus spp.			Juncaceae	-	-	Grass & grasslike (GG)
Lantana camara	Lantana	*	Verbenaceae	-	-	
Lastreopsis decomposita	Trim Shield Fern		Dryopteridaceae	-	-	Fern (EG)
Lepidosperma laterale	Variable Sword-sedge		Cyperaceae	-	-	Grass & grasslike (GG)
Leptospermum polygalifolium	Tantoon		Myrtaceae	-	-	Shrub (SG)
Lindsaea linearis	Screw Fern		Lindsaeaceae	-	-	Fern (EG)
Lindsaea microphylla	Lacy Wedge Fern		Lindsaeaceae	-	-	Fern (EG)
Livistona australis	Cabbage Palm		Arecaceae	-	-	Other (OG)
Lobelia purpurascens	whiteroot		Campanulaceae	-	-	Forb (FG)
Lomandra longifolia	Spiny-headed Mat-rush		Lomandraceae	-	-	Grass & grasslike (GG)
Lomandra obliqua			Lomandraceae	-	-	Grass & grasslike (GG)
Marsdenia rostrata	Milk Vine		Apocynaceae	-	-	Other (OG)
Melaleuca linariifolia	Flax-leaved Paperbark		Myrtaceae	-	-	Shrub (SG)

Scientific name	Common name	Exotic	Family	BC Act	EPBC Act	BAM growth form group
Melaleuca spp.			Myrtaceae	-	-	Shrub (SG)
Melicope micrococca	Hairy-leaved Doughwood		Rutaceae	-	-	Shrub (SG)
Microlaena stipoides	Weeping Grass		Poaceae	-	-	Grass & grasslike (GG)
Myrsine variabilis			Primulaceae	-	-	Shrub (SG)
Notelaea longifolia	Large Mock-olive		Oleaceae	-	-	Tree (TG)
Oplismenus imbecillis			Poaceae	-	-	Grass & grasslike (GG)
Osteospermum spp.	Stinking Roger/South African daisy	*	Asteraceae	-	-	
Oxalis perennans			Oxalidaceae	-	-	Forb (FG)
Parsonsia straminea	Common Silkpod		Apocynaceae	-	-	Other (OG)
Pittosporum undulatum	Sweet Pittosporum		Pittosporaceae	-	-	Shrub (SG)
Poaceae indeterminate	Grasses, reeds and bamboos	*	Poaceae	-	-	
Polyscias sambucifolia	Elderberry Panax		Araliaceae	-	-	Shrub (SG)
Pseuderanthemum variabile	Pastel Flower		Acanthaceae	-	-	Forb (FG)
Pteridium esculentum	Bracken		Dennstaedtiaceae	-	-	Fern (EG)
Richardia brasiliensis	Mexican Clover	*	Rubiaceae	-	-	
Rubus parvifolius	Native Raspberry		Rosaceae	-	-	Shrub (SG)
Rubus spp.			Rosaceae	-	-	Shrub (SG)
Senecio spp.	Groundsel, Fireweed		Asteraceae	-	-	Forb (FG)
Sida rhombifolia	Paddy's Lucerne	*	Malvaceae	-	-	
Tradescantia fluminensis	Wandering Jew	*	Commelinaceae	-	-	
Trema tomentosa	Native Peach		Ulmaceae	-	-	Shrub (SG)
Trifolium repens	White Clover	*	Fabaceae (Faboideae)	-	-	
Viburnum spp.		*	Adoxaceae	-	-	
Viola hederacea	Ivy-leaved Violet		Violaceae	-	-	Forb (FG)
Xanthorrhoea spp.			Xanthorrhoeaceae	-	-	Other (OG)

* Exotic species