2023

Annual Review

BULGA
COAL

GLENCORE

ANNUAL REVIEW

1 January – 31 December 2023

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Bulga Coal Pty Ltd

Project Director:	Adam Williams
Project Manager:	Eva Tew
Report No.	24009/R01
Date:	March 2024

Environmental & Social Consultants

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Cover Photo: A cultural cool burn was held in Bulga Coal's Wollombi Brook Conservation Area in August 2023 to control weeds, activate natural regeneration and create connection between the indigenous community and the land. The burn was conducted by NSW Local Land Services and Firesticks Alliance.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Draft	Adam Williams	18 March 2024	Adam Williams	18 March 2024
Final	Adam Williams	25 March 2024	Adam Williams	25 March 2024

Name of Operation	Bulga Coal
Name of Operator	Bulga Coal Management Pty Ltd
Development consent / project approval #	Bulga Underground Operations DA 376-8-2003 Bulga Open Cut SSD-4960
Name of holder of development consent / project approval	Bulga Coal Management Pty Ltd
Mining lease #	ML 1494, ML 1547, ML 1674, ML 1717, ML 1788, CL 224, sublease within Mount Thorley Operations (CL 219), AUTH 447, AUTH 450, EL 5277, EL 5461, EL 8315
Name of holder of mining lease	Saxonvale Coal Pty Ltd; Saxonvale Coal Pty Ltd and Nippon Steel Australia Pty Ltd; and Bulga Coal Management Pty Ltd
Water licence #	WAL36221, WAL41543, WAL41544, WAL41545, WAL41546, WAL41687
Name of holder of water licences	Bulga Coal Management Pty Ltd, Saxonvale Coal Pty Ltd, Nippon Steel & Sumitomo Metal Australia Pty Ltd, Beltana Highwall Mining Pty Ltd
RMP start date	1 August 2022
Annual Review start date	1 January 2023
Annual Review end date	31 December 2023

I, Ralph Northey,

certify that this audit report is a true and accurate record of the compliance status of Bulga Coal for the period 1 January 2023 to 31 December 2023 and that I am authorised to make this statement on behalf of Bulga Coal Management Pty Ltd.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(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	Ralph Northey
Title of authorised reporting officer	Environment and Community Manager
Signature of authorised reporting officer	
Date	27 March 2024

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Appendices

1.0 Statement of Compliance

The Bulga Coal Complex (Bulga Coal) includes the Bulga Open Cut and the Bulga Underground Operations. During the reporting period Bulga Open Cut operated under development consent SSD-4960, while Bulga Underground Operations operated under DA 376-8-2003. Both sites operate under Environment Protection Licence (EPL) 563 and several mining and exploration leases.

Table 1.1 outlines compliance against major approvals. Where non-compliances have been identified, they are listed in **Table 1.2** and detailed in later sections of this report. **Table 1.3** describes the status of non-compliance.

Table 1.1 Summary Statement of Compliance for Major Approvals

Licence	Were all conditions of the Licence complied with?
DA SSD-4960	No
DA 376-8-2003	No
EPBC 2002/773	Yes
EPBC 2012/6637	Yes
EPBC 2018/8300	Yes
EPL 563	No
ML 1494	Yes
ML 1547	Yes
ML 1674	Yes
ML 1717	Yes
ML 1788	Yes
EL 5277	Yes
EL 5461	Yes
EL 8315	Yes
AUTH 447	Yes
AUTH 450	Yes
CL 224	Yes

Table 1.2 Summary of Non-Compliances

Approval/ Licence	Condition / Legislative Reference	Condition Summary	Compliance Status	Date	Details of the Non-compliance	Corrective Action/s	Section of this Annual Review
SSD-4960	Schedule 3, Conditions 3 and 4	Noise Criteria	Non-Compliant	6/11/2023	On the night of 6 November during the attended noise monitoring at the BCC7 monitoring location the night $LAeq_{15\text{-minute}}$ criterion of 36 dB was exceeded. The immediate response included modifying operations to reduce noise levels (trucks and an excavator ceased operating). A follow up measurement was completed on 10 November and recorded 27 dB which was below the criteria.	Additional refresher training was carried out with dispatch and Open Cut Examiner's regarding the attended noise monitoring and response requirements.	**Section 6.2.2** and **Section 11.1**
SSD-4960	Schedule 3, Condition 16	Air Quality Monitoring	Non-Compliant	Various	Failure to continuously monitor PM_{10} at air quality monitors D1, D3, D5 and D11. Yearly valid data for all four monitors was above 96%.	Causes of the failures were investigated and issues fixed, or power restored.	**Section 11.2.1**
DA 376-8-2003	Schedule 4, Condition 22						
SSD-4960	Schedule 3, Condition 16	Air Quality Monitoring	Non-Compliant	Various	Failure to continuously monitor $PM_{2.5}$ at air quality monitors D2 and D10. Yearly valid data for both monitors was above 98.5%.	Causes of the failures were investigated and issues fixed, or power restored.	**Section 11.2.1**
DA 376-8-2003	Schedule 4, Condition 22						
DA 376-8-2003	Appendix 4, Condition 4						
EPL 563	Condition M2.2	Air Quality Monitoring	Non-Compliant	Various	Failure to continuously monitor PM_{10} at air quality monitors EPA Point 9 and EPA Point 10. Yearly valid data for both monitors was above 97.8%.	Causes of the failures were investigated and issues fixed, or power restored.	**Section 11.2.1**

Approval/ Licence	Condition / Legislative Reference	Condition Summary	Compliance Status	Date	Details of the Non-compliance	Corrective Action/s	Section of this Annual Review
EPL 563	Condition M4.1	Weather Monitoring	Non-Compliant	Various	Relative humidity data was not monitored continuously at the EPA Point 20 - Flares Meteorological Station.	The cause of the failure was investigated, and the humidity sensor was replaced at the Flares Meteorological Station.	**Section 11.2.2**
EPL 563	Condition M9.1	The Licensee must continuously operate and maintain communication equipment which makes the conductivity and flow measurements, taken at Point 11 (Hunter River Salinity Trading Scheme (HRSTS) discharge point).	Non-Compliant	05/03/2023 to 09/06/2023	HRSTS communications were interrupted to the Water NSW website and were not permanently re-established for over three months. The interruption was related to low voltage issues and insufficient backup battery life, which damaged the Water NSW modem. Communications were not interrupted to the Bulga internal SCADA system or the internal HRSTS portal.	Corrective actions included: • An upgraded modem was ordered and installed; • The backup battery system was upgraded to a two-battery system; • Low voltage cut off protection was installed for the modem; • The dam level pump enclosure was upgraded; and • The dam level power supply was upgraded to a 12v power supply with external battery storage and solar panel.	**Section 11.2.3**

Table 1.3 Compliance Status Categories

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-compliance	**Non-Compliant**	Non-compliance which does not result in any risk of environmental harm

Section 6.0 and **Section 7.0** of this report detail the environmental management and water management performance of Bulga Coal, respectively. Non-compliances are discussed in **Section 11.0**.

2.0 Introduction

2.1 Mine Operations

Bulga Coal is located approximately 12 kilometres (km) southwest of Singleton, and 2 km from the townships of Broke and Bulga in the Upper Hunter Valley of New South Wales (NSW) (refer **Figure 2.1**). Bulga Coal comprises two coal mining operations, being Bulga Open Cut and Bulga Underground Operations. The Coal Handling and Processing Plant (CHPP) and rail loading facility are on the eastern side of the site. In May 2018, Bulga Underground Operations ceased mining and the mine was sealed in July 2018.

Bulga Coal is managed by Bulga Coal Management Pty Ltd on behalf of the Bulga Joint Venture. Bulga Coal Management Pty Ltd is owned by Oakbridge Pty Ltd, which is the majority shareholder (87.5%) of the Bulga Joint Venture. Glencore is the majority shareholder of Oakbridge Pty Ltd.

This report details the environmental management performance of Bulga Coal over the period 1 January 2023 to 31 December 2023. It has been prepared in accordance with the *Annual Review Guideline* (DPE, 2015) and satisfies:

- Schedule 6, Condition 4 of Bulga Underground Operations Development Consent DA 376-8-2003.
- Schedule 5, Condition 4 of Bulga Optimisation Project Development Consent SSD-4960.

2.2 Mine Contacts

The contact details for the personnel responsible for environmental management and community relations at Bulga Coal are provided in **Table 2.1**.

Table 2.1 Contacts for Bulga Coal

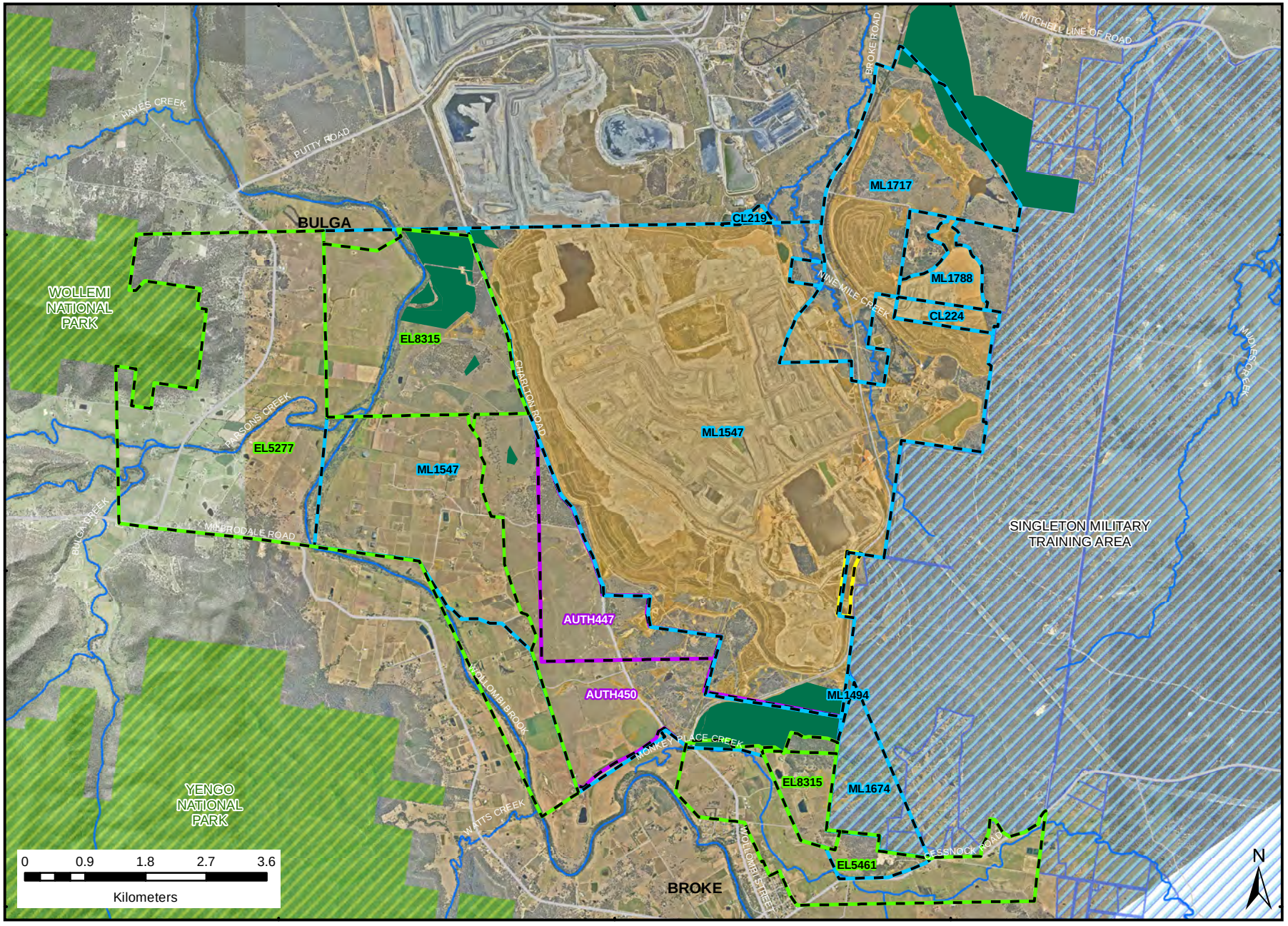
Contact	Position	Contact Details
Ralph Northey	Bulga Coal Environment and Community Manager	T: 02 6570 2539
		E: Ralph.Northey@glencore.com.au
Murray Gregson	Bulga Coal Operations Manager	T: 02 6570 2400
		E: Murray.Gregson@glencore.com.au

2.2.1 Mining Personnel

As at the end of the reporting period, Bulga Coal employed approximately 951 full time equivalent personnel.

Bulga Coal

FIGURE 2.1 - Bulga Coal Locality and Licences 2023



Legend

- Mining_Lease_AMA
- Mining Lease
- Exploration Licence
- Exploration Authorisation
- Biodiversity Offset Areas
- Disturbance
- Singleton Military Training Area
- National Park Reserve
- Main Roads
- Local Roads
- Railway
- Watercourse

GDA2020

Date Created: 18/03/2024
Map Size: A4 Landscape
Scale: 1:80,390
Map Created By: rabbott
Coordinate System: GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

File Path Ref: Q:\03_MapDocuments\18_Reporting\Annual_Review\2023\AR FIGURES\20240201_Figure_2_1_AR_Locality_A4_GDA2020.mxd

3.0 Approvals

3.1 Development Consents and Commonwealth Approvals

Bulga Coal operates under two development consents: the Bulga Underground Operations DA 376-8-2003 and Bulga Open Cut SSD-4960.

In October 2023 Bulga Coal commenced an application with Department of Planning, Housing and Infrastructure (DPHI) to modify the Bulga Open Cut SSD-4960 (Mod 5). Key aspects of the modification include:

- Increased stability of the final landform with reduced overall final void slope angles (reduced from 18° to an average of approximately 12.5° based on the proposed conceptual final void design).
- Improved drainage sympathetic to erosion and differential settlement.
- Improved suitability of the final void for pumped-hydro electricity generation and increased stability in the final void through increased highwall/low wall exposure.

Bulga Coal will submit the Modification Report for Mod 5 to DPHI in Q2 2024.

Bulga Coal also operates in accordance with three Commonwealth approvals issued by the Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW) under the *Environment Protection and Biodiversity Conservation Act 199* (EPBC Act). For more information regarding compliance with Commonwealth approval conditions refer to **Appendix A**.

Details of the current development consents and Commonwealth approvals are provided in **Table 3.1**.

Table 3.1 Development Consents and Commonwealth Approvals

Consent	Details	Expiry Date
DA 376-8-2003	Bulga Coal Continued Underground Operations	23 February 2031
	Mod 1 – Drift relocation (11 April 2006)	
	Mod 2 – Increase CHPP throughput (25 October 2006)	
	Mod 3 – Longwall realignment (1 October 2007)	
	Mod 4 – Methane Abatement and Gas-fired Power Plant (14 July 2010)	
	Mod 5 – Blakefield North Longwall Modification and Gas Fired Power Plant (18 October 2013)	
	Mod 6 – Modification to noise criteria, flora and fauna criteria, and independent auditing (8 December 2016)	
	Mod 7 – Relocation of the 9 MW power station and associated flares (16 July 2020)	
	Mod 8 – Change to Annual Review reporting period and change to sigma theta method for meteorological monitoring (24 February 2022)	
SSD-4960	Bulga Optimisation Project (1 December 2014)	31 December 2039
	Mod 1 – Eastern Emplacement Area and Tailings Storage (17 January 2017)	

Consent	Details	Expiry Date
	Mod 2 – Extend the period for construction of the outer face of the Noise and Visual Bund (30 August 2018)	
	Mod 3 – Extend approval to extract additional 64 Mt from beneath tailings storage (16 July 2020)	
	Mod 4 – Change to Annual Review reporting period and change to sigma theta method for meteorological monitoring (24 February 2022)	
EPBC 2002/773	Commonwealth Land Consent (as varied 25 October 2015)	31 December 2034
	Mod 2002/773 – Commonwealth Land Subsidence Management Plan (SMP) Submission Schedule	
EPBC 2012/6637	Bulga Open Cut (as varied 5 January 2016)	31 December 2036
EPBC 2018/8300	Bulga Open Cut (as varied 9 September 2021)	31 December 2049

3.2 Mining Tenements

Mining operations at Bulga Coal are undertaken within Mining Lease (ML) 1494, ML 1547, ML 1674, ML 1717, ML 1788, Coal Lease (CL) 224 and a sublease within Mount Thorley Operations (CL 219). Bulga Coal also has land area AMA1004 for ancillary mining activities annexed to ML1547. Exploration activities are undertaken in accordance with Exploration Lease (EL) 5277, EL 5461, EL 8315, Authorisation (AUTH) 447 and AUTH 450.

Mining tenements are summarised in **Table 3.2** and are shown on **Figure 2.1**.

Table 3.2 Mining Tenements

Tenement	Details	Expiry Date
ML 1494	Saxonvale Coal Pty Ltd and Nippon Steel and Sumitomo Metal Australia Pty Ltd	20 September 2027
ML 1547	Bulga Coal Management Pty Ltd	4 April 2025[1]
ML 1674	Bulga Coal Management Pty Ltd	22 March 2033
ML 1717	Bulga Coal Management Pty Ltd	15 September 2036
ML 1788	Bulga Coal Management Pty Ltd	19 June 2040
Sublease within CL 219	Sublease to Bulga Coal within the Mount Thorley Operations CL 219	1 June 2025
CL 224	Saxonvale Coal Pty Ltd	23 December 2044
EL 5277	Saxonvale Coal Pty Ltd	7 April 2024[1]
EL 5461	Saxonvale Coal Pty Ltd and Nippon Steel and Sumitomo Metal Australia Pty Ltd	3 April 2026
EL 8315	Saxonvale Coal Pty Ltd	13 October 2027
AUTH 447	Saxonvale Coal Pty Ltd	2 September 2025
AUTH 450	Saxonvale Coal Pty Ltd	30 December 2024

[1] Renewal sought

3.2.1 Rehabilitation Management Plan and Outcome Documents Status

The *Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021* (the Regulation) introduced new standard rehabilitation and reporting conditions on mining leases. The Regulation commenced on 2 July 2021, with a transition period to 2 July 2022. Following the transition period, Mining Operations Plans cease to exist in NSW. To meet the requirements of the Regulation, Bulga Coal developed and implemented a Rehabilitation Management Plan, Forward Program and Rehabilitation Outcome Documents. The Bulga Coal Rehabilitation Objectives Statement and Final Landform and Rehabilitation Plan were approved by the NSW Resource Regulator (NSW RR) on 18 October 2023.

3.3 Licences

The licences held by Bulga Coal are detailed in **Table 3.3**. Bulga Coal does not hold any surface water licences for mining purposes. Surface water drawn for mining purposes is supplied from the Mount Thorley Water Supply Joint Venture, operated by Singleton Council. It is also supplied by Yancoal's Mount Thorley Mine through an agreement with Bulga Coal.

Table 3.3 Bulga Coal Licences

Licence	Details
Environmental Protection Licence (EPL)	
EPL 563	For scheduled activities: Coal works > 5,000,000 t annual handling capacity; Crushing, grinding or separating >100,000–500,000 t annual processing capacity; and Mining for coal >5,000,000 t annual production capacity. Anniversary Date: 20 July.
Water Licences	
WAL41687	Mining: Volume licence limit 500 ML. Sydney Basin-North Coast Groundwater Source.
WAL41546	Mining: Volume licence limit 365 ML. Sydney Basin-North Coast Groundwater Source.
WAL41543	Mining: Volume licence limit 500 ML. Sydney Basin-North Coast Groundwater Source.
WAL41544	Mining: Volume licence limit 500 ML. Sydney Basin-North Coast Groundwater Source.
WAL41545	Mining: Volume licence limit 500 ML. Sydney Basin-North Coast Groundwater Source.
WAL36221	Mining: Wollombi Brook Aquifer leakage to Permian coal measures 300 ML.
20BL166867	Monitoring (mining bore): GW1 – GW10. Total of 16 bores for monitoring purposes.
20BL167776	Monitoring: P1 – P3, P4A, P4B, P5 – P8 and V3. Licence for total of 9 bores for monitoring purposes.
20BL167777	Monitoring: V1, V2, F1 and F2.
20BL169204	Monitoring: Bore – ACARP Project.
20BL169246	Monitoring: Bore – ACARP Project.
20BL172659	Monitoring: WBR180 and WBR181.
20BL172660	Monitoring: WBR182 and WBR183.
20BL173014	Monitoring: SBD194, SBD196.
20BL173617	Monitoring: Lot 61/755264.
20BL173618	Monitoring: Lot 34/755264.
20BL173619	Monitoring: Lot 33/755264.
20BL173620	Monitoring: Lot 23/755264.
20BL173621	Monitoring: Lot 24/755264.
20BL173640	Monitoring Bore – 25//755264.
20BL173657	Monitoring Bore – 22//755264.
20BL173708	Monitoring Bore – 11//730762.

Licence	Details
Radiation/Dangerous Goods Licences	
Radiation Management Licence 5061333	Radiation regulated material ID 8929 – Serial Nos: 054 / 6230GK Radiation regulated material ID 8934 – Serial Nos: 055 / 4421GK Radiation regulated material ID 8935 – Serial Nos: 057 / 4412GK Radiation regulated material ID 8938 – Serial Nos: 056 / 4376GK Radiation regulated material ID 8939 – Serial Nos: 053 / 6218GK Radiation regulated material ID 9581 – Serial Nos: 436-03-07 / OCS519 Radiation regulated material ID 9582 – Serial Nos: 2173 / 0532/06 Radiation regulated material ID 9583 – Serial Nos: 2190 / 0528/07 Radiation regulated material ID 9584 – Serial No: 2187 Radiation regulated material ID 9585 – Serial Nos: 2188 / 0539/07 Radiation regulated material ID 20634 – Serial Nos: S500160113F / BC-1754 Radiation regulated material ID 20635 – Serial Nos: S500170113F / BC-1755 Radiation regulated material ID 20636 – Serial Nos: S500180113 / BC-1756 Radiation regulated material ID 20637 – Serial Nos: S500190113/ BC-1757 Radiation regulated material ID 20638 – Serial Nos: S5001A0113F/ BC-1758 Radiation regulated material ID 20639 – Serial Nos: S5001B0113F/ BC-1759
HAZNOT0001098	Hazardous Chemicals Notification
XSTR100095	Licence to Store Explosives

4.0 Operations Summary

Bulga Open Cut mining activities undertaken in 2023 are displayed on **Figure 4.1**. There were no underground mining activities undertaken in 2023 other than operation of existing gas drainage infrastructure and the gas fired power station.

4.1 Exploration

A total of five (5) exploration holes were drilled during 2023 to define the true seam dip at the inflection point of the Mt Thorley Monocline throughout the mine plan. The locations of the exploration holes are shown on **Figure 4.1.**

No Bulga Underground prospecting exploration activities occurred in 2023.

4.2 Land Preparation

Land preparation ahead of open cut mining operations involves the construction of erosion and sediment control measures, clearing vegetation, stripping and stockpiling topsoil. These activities were undertaken in accordance with the *Bulga Coal Biodiversity Management Plan* (BMP) and the *Bulga Coal Rehabilitation Management Plan* (RMP).

Grassland, fragmented woodland communities and previously rehabilitated land is cleared with topsoil stripped ahead of mining. Vegetation and vegetative matter is either mulched and incorporated into topsoil or stockpiled for future use in rehabilitation.

During 2023, 16.16 ha was disturbed to allow mining, overburden dumping and construction activities (roads, drains, dams) to commence. There was also 97.76 ha of existing rehabilitation cleared to facilitate overburden dumping across the East Pit and Main Pit emplacements.

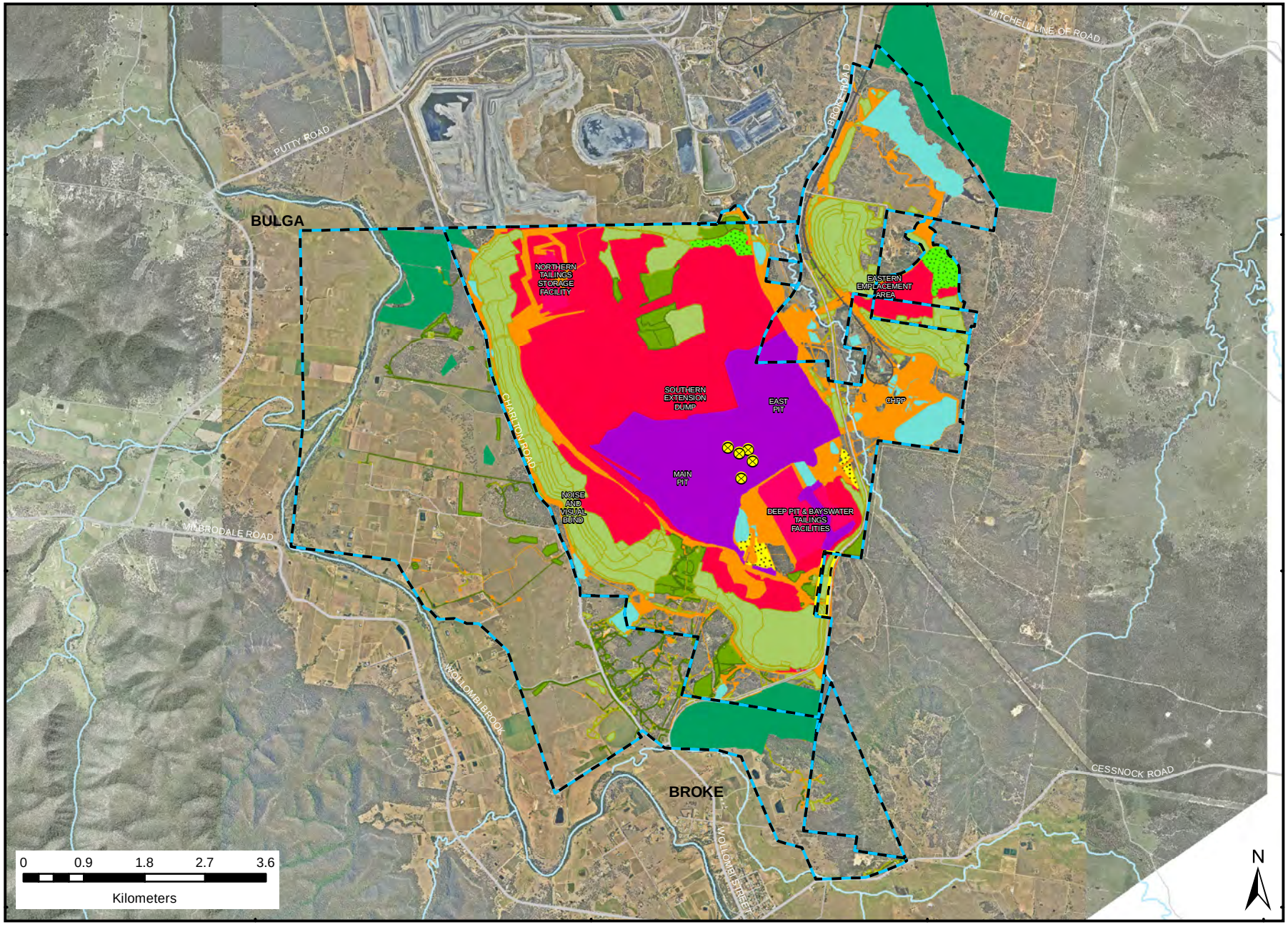
Approximately 31,469 m^3 of topsoil was stripped and 33 habitat trees were salvaged from clearing areas in advance of mining.

Clearing and disturbance areas are shown on **Figure 4.1**.

Bulga Coal

FIGURE 4.1 - Bulga Open Cut Summary of Operations 2023

GLENCORE



Legend

- Current_Authorisations
- Mining Lease AMA
- Biodiversity Offset Areas
- 2023 Rehabilitation
- 2023 Disturbance
- 2023 Exploration Completed

Mining Domain Type

- Infrastructure Area
- Overburden Emplacement Area
- Tailings Storage Facility
- Active Mining Area (Open cut void)
- Water Management Area

Rehabilitation Phase

- Ecosystem and Land Use Establishment
- Ecosystem and Land Use Development
- Main Roads
- Local Roads
- Watercourse
- Railway

GDA2020

Date Created: 18/03/2024
Map Size: A4 Landscape
Scale: 1:80,283
Map Created By: rabbott
Coordinate System:
GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

File Path Ref: Q:\03_MapDocuments\18_Reporting\Annual_Review\2023\AR FIGURES\20240201_Figure_4_1_AR_BOC_Operations_2023_A4_GDA2020.mxd

4.3 Mining Operations

Bulga Underground Operations

Bulga Underground Operations finished producing coal in May 2018 with all working sealed in July 2018. There were no underground mining activities conducted in 2023 of other than the operation of gas drainage infrastructure in support of the Bulga Open Cut.

Bulga Open Cut

Bulga Open Cut continued mining coal reserves from the East Pit and Main Pit in 2023. Mining is progressing in a southerly direction.

Bulga Open Cut placed overburden on the Eastern Emplacement Area and Southern Extension Dump. In-pit dumping occurred in the Main Pit and East Pit. Overburden was stripped using truck/shovel and excavator fleets. Coal was mined by a fleet of hydraulic excavators and trucks. Run of Mine (ROM) coal was transported by dump truck via an overpass on Broke Road to the ROM coal hopper.

Thirteen (13) Komatsu 930E-5 haulage trucks were acquired in 2023, one Cat 777 Water Cart was acquired and commenced operations in December, and five (5) Cat 793D XQ haulage trucks (on hire) were removed from the fleet. The total mining fleet as at 31 December 2023 is listed in **Table 4.1**.

Table 4.1 Equipment Fleet

Type	Model	Units
Shovels – Electric	P&H4100	1
Excavators – Hydraulic	Hitachi EX8000	1
	Hitachi EX5500	1
	Hitachi EX3600	1
	Liebherr EX9400	1
	Liebherr EX9250	1
	Liebherr EX9100	2
	Cat 6040	2
	Cat 6060	2
Haulage Trucks	Cat 793C XQ	6
	Cat 793D XQ	33
	Cat 789C XQ	9
	Cat 797F XQ	7
	Komatsu 930E-5	13
Water Carts	Cat 777F Hire Water Cart	1 (hire)
	Cat 789C XQ Water Trucks	4
	Cat 777 Water Cart	1
Front End Loaders	LeTourneau L1850	2
	Cat 980M Wheel Loader (Hire)	1 (hire)
Dozers	Cat D11T	4
	Cat D11R	1
	Cat D10T	3

Type	Model	Units
	Cat D10T2	5
	Cat 854K	2
	Cat D11	5
Graders	Cat 24 series	1
	Cat 24M	2
	Cat 16M	1
	Cat 18 Series	2
Fuel Trucks	Cat 773E	2
	Cat 775G	1
Drills	Sandvik D75K	1
	Terex SKS-W	2
	Terex SKF	2
Tractors	John Deer 6155M	1
	John Deer 6630	1

A summary of coal production and waste material (overburden and reject) production for the Bulga Open Cut is provided in **Table 4.2**.

Table 4.2 Production and Waste Summary for the Bulga Open Cut

Aspect	Approved Limit SSD-4960	2022 Reporting Period (Actual)	2023 Reporting Period (Actual)	2023 Predictions (Forecast)	2024 Predictions (Forecast)
Waste Rock/ Overburden (bcm)	N/A	56,282,130	66,356,721	60,328,965	67,460,000
ROM Coal (t)	12,200,000	9,749,513	10,195,451	10,404,000	10,038,851
Coarse reject (t)	N/A	3,253,776	3,191,842	2,890,000	3,541,141
Fine Reject (tailings) (t)	N/A	709,795	636,777		
Saleable Product (t)	N/A	6,345,168	6,444,555	7,120,000	6,654,771

Note – Forecast total waste volume predictions do not split the volumes of fine and coarse reject produced per year.

4.4 Other Operations

4.4.1 Coal Handling and Preparation Plan

10.2 million tonnes (Mt) of ROM coal was washed, producing 6.44 Mt of saleable product coal. The CHPP has approval to wash up to 20 Mt of ROM coal per year. 6.18 Mt of coal was railed to the Port of Newcastle for export and 0.687 Mt of coal was railed for domestic use.

4.4.2 Tailings Management

Deposition of tailings to the Northern Tailings Storage Facility (NTSF) continued for the duration of 2023. In July 2023 Cell A and Cell B in the NTSF became one storage cell. No tailings were pumped to underground workings during 2023.

The dredging of tailings for relocation from the Deep Pit and Bayswater tailings facilities to the NTSF continued in 2023. In September dredging of tailings from the Bayswater tailings facility ceased. A total of 5,541 kbcm of tailings was relocated to the NTSF during 2023.

4.4.3 Construction

Bulga Coal construction works included:

- upgrade of the CHPP administration meeting room
- construction of colour bond fencing adjacent to Broke Road
- relocation of temporary shelter structure (Igloo) at the Mine Infrastructure Area (MIA)
- commenced construction of mine dewatering pump station, associated pipelines and power supply
- commenced civil construction of a new bulk fuel and lubricate facility
- completion and commissioning of the Nine Mile Creek clean water management system upgrades and Dam C3A in accordance with the *Bulga Coal Water Management Plan*
- construction of S53 Dam commenced.

The CHPP was upgraded to improve coal throughput and recovery, and to reduce water usage. The upgrades included:

- replacement of bath magnetic separators to improve magnetite recovery
- continuation of site fire water storage and system upgrade.

4.4.4 Demolition

Following the cessation of underground mining, Bulga Underground Operations infrastructure has continued to be demolished/decommissioned including:

- demolition of concrete footings associated with a reclaim conveyor structure
- demolition of remaining structures at the Bulga Underground MIA
- continued scrapping and offsite disposal of decommissioned equipment in the laydown area
- removal of redundant powerlines.

Demolition works were carried out by a licensed demolition contractor in accordance with *Australian Standard AS 2601-2001.*

4.4.5 Waste Management

Waste management is undertaken in accordance with the *Bulga Complex Waste Management Plan* and EPL 563. Waste is removed by a licenced contractor and is recycled where possible. Waste removed from site includes batteries, light vehicle tyres, scrap metal, domestic waste, fuel and oil filters, solvent, radiator coolant, wooden pallets, oily rags and hydrocarbon contaminated material from maintenance workshops.

Bulga Coal produced 4,211 t of waste during 2023, which represents a substantial decrease from previous years (12,295 t in 2022). The main cause of this variation has been the completion of the dragline demolition and recycling of Bulga Underground Operations equipment (8,949 t) in 2022. Scrapping and offsite disposal of redundant underground equipment continued during 2023, with lower volumes (686 t) compared to 2022. As much as was practical equipment and parts have been sold for reuse. 82.3 % of the waste produced by Bulga Coal (3,465 t) was recycled. 1,389 t of scrap steel was recycled during the reporting period. Bulga generated 43.9 t of hazardous waste which included oily rags/absorbents, contaminated soil and medical/sanitary waste. Bulga produced 702.2 t of non-hazardous waste (including mixed solid waste) that was disposed to landfill.

32.1 t of recycled gypsum plasterboard was received at the premises for use in rehabilitation.

Waste oil and grease removed from equipment is stored in bunded tanks. Wastewater generated from the workshop areas is treated through hydrocyclone oily water separators. Waste oil, grease and oily water from oil water separators are then removed by an authorised waste contractor for recycling.

The treatment and disposal of sewage at Bulga Open Cut is through an extended aeration Sewage Treatment Plant (STP). Effluent from this plant goes to two maturation ponds before it is returned to the CHPP circuit water.

Sewage from the East Pit Muster is treated by an extended aeration STP. Effluent is also treated with ultra-violet (UV) light. Treated water is transferred to a mine water dam for reuse. Deactivated sludge is transported to the Singleton Council Treatment Works Depot.

4.4.5.1 Comparison Against Predictions

The *Bulga Optimisation Project – Environmental Impact Statement* (Umwelt, 2013) predicted waste to be generally consistent with the current operations at the time. Operations in 2012 disposed of 507 t of waste to landfill, 1,978 t of waste (or approximately 80 per cent of waste generated by the Bulga Surface Operations) was recycled or reused.

Waste disposed to landfill was 702 t during 2023 which was above the 507 t outlined/predicted. Bulga Coal recycled 3,465 t of waste (82.3 % of all waste produced at Bulga Coal). While the total volume of recycled waste was higher than predictions, the percentage of waste recycled exceeded predictions.

4.4.5.2 Long Term Analysis

A summary of waste disposal from 2017 to 2023 is presented in **Figure 4.2**. The figure shows non-hazardous waste recycled has fluctuated significantly between 2021 to 2023. The changes in volumes and recycled material reflect the staged decommissioning of the underground laydown areas and dragline decommissioning (8,949 t) during 2022.

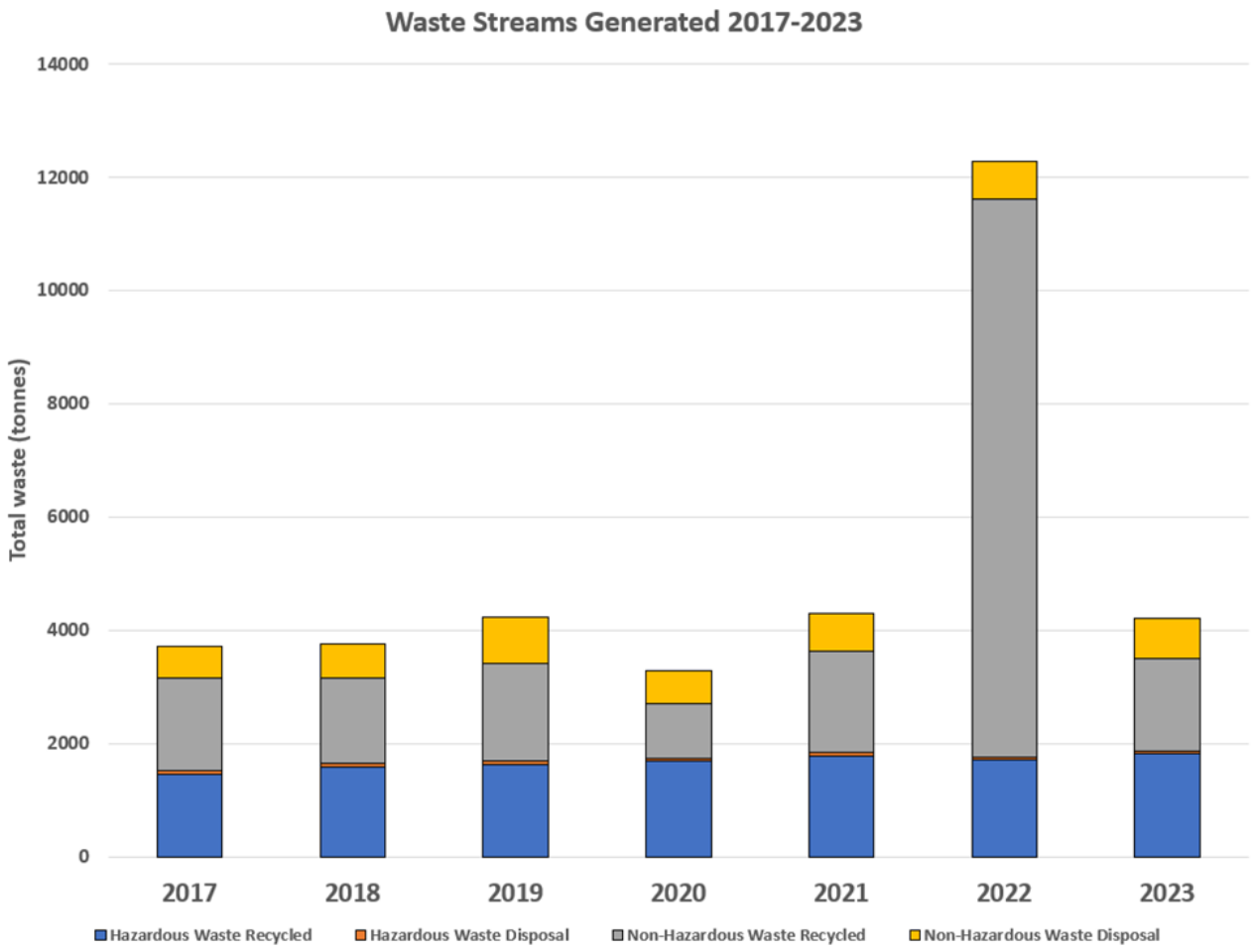


Figure 4.2 2018 – 2023 Waste Streams Generated

4.4.6 Hazardous Materials Management

Hazardous and dangerous goods are stored and labelled according to the relevant Australian Standard.

Hazardous materials stored at Bulga Open Cut have been notified to SafeWork NSW (Acknowledgement HAZNOT0001098).

Hazardous waste stored at Bulga Open Cut is tracked and transported by a licenced waste transporter and disposed of at a licenced facility.

Explosives are stored in a licenced explosive magazine according to SafeWork NSW requirements. Bulga Coal hold Licence No. XSTR100095 for the storage of explosives at Bulga Open Cut.

4.5 Next Reporting Period

4.5.1 Bulga Underground Operations

Activities proposed in 2024 are generally consistent with DA 376-8-2003. Underground mining activities will include:

- continued operation of the Blakefield South goaf drainage system
- continued decommissioning and demolition of Bulga Underground Operations infrastructure
- rehabilitation of redundant gas drainage infrastructure, access tracks and pipelines.

4.5.2 Bulga Open Cut

Activities proposed in 2024 are generally consistent with SSD-4960. **Figure 4.3** illustrates the proposed operations.

Mining operations will continue in the Main Pit and East Pit with overburden emplacement continuing in the Eastern Emplacement Area, Noise and Visual Bund and in-pit dumping. Dredging (relocation) of tailings from Deep Pit to the in-pit NTSF will continue. This will enable mining of the underlying coal.

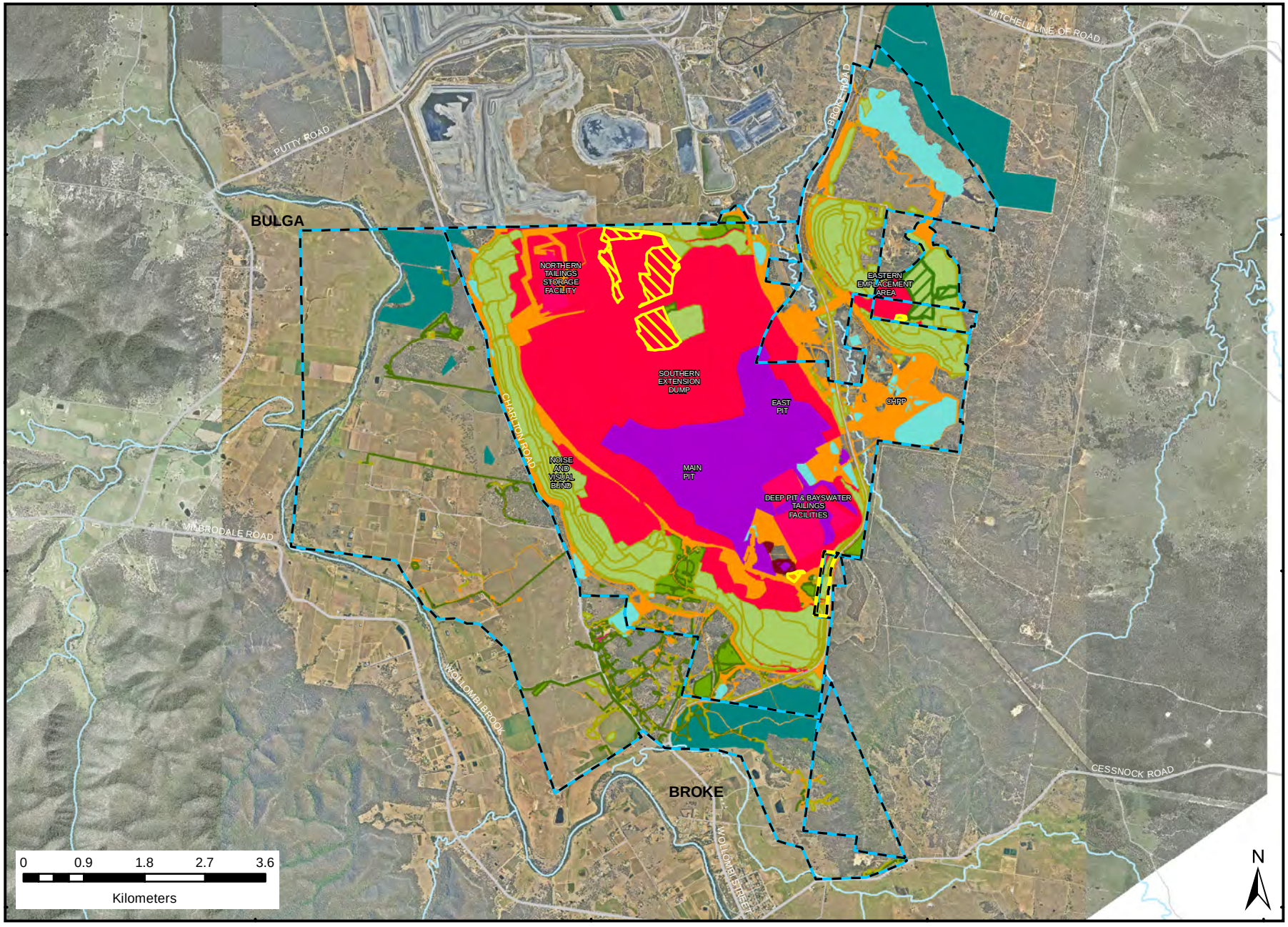
Construction and decommissioning activities will include:

- continued Bulga Underground sealing projects to manage the underground atmosphere
- continued construction of mine dewatering pump station, associated pipelines and power supply
- commissioning Dam S53 and associated pump station, pipelines and drainage
- relocation of the second Igloo at MIA
- modification and upgrades to offices and bath house at the East Pit Offices
- construction of a light vehicle workshop at the East Pit Offices
- construction of a light vehicle wash bay facility
- continued construction and commissioning of a bulk fuel facility
- construction of a four bay maintenance workshop at the MIA.

Bulga Coal

FIGURE 4.3 - Bulga Open Cut Proposed Operations 2024

GLENCORE



Legend

- Current_Authorisations
- Mining Lease AMA
- Offset Area Boundaries
- 2024 Planned Disturbance
- 2024 Planned Rehabilitation
- Rehabilitation Redisturbance

Mining Domain Type

- Infrastructure Area
- Overburden Emplacement Area
- Tailings Storage Facility
- Underground Mining Area (SMP)
- Active Mining Area (Open cut void)
- Water Management Area

Rehabilitation Phase

- Ecosystem and Land Use Establishment
- Ecosystem and Land Use Development
- Main Roads
- Local Roads
- Watercourse
- Railway

GDA2020

Date Created: 18/03/2024
Map Size: A4 Landscape
Scale: 1:80,362
Map Created By: rabbott
Coordinate System: GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

File Path Ref: Q:\03_MapDocuments\18_Reporting\Annual_Review\2023\AR FIGURES\20240201_Figure_4_3_AR_BOC_Operations_2024_A4_GDA2020.mxd

5.0 Actions Required from Previous Annual Review

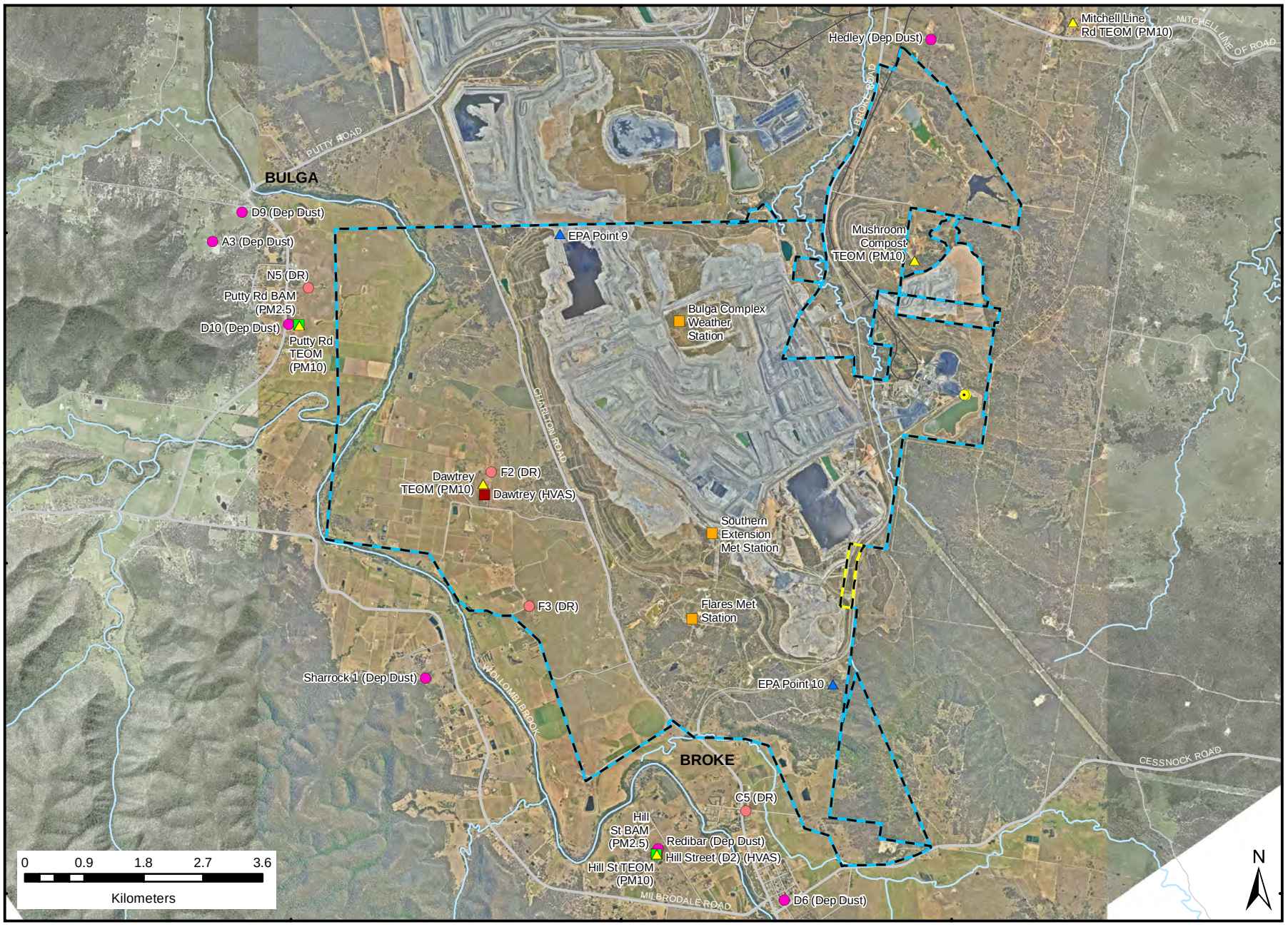
The 2022 Annual Review was provided to DPHI on 31 March 2023. DPHI considered the Annual Review to generally meet the requirements of the approval in relation to reporting and the Annual Review Guideline (DPE, 2015). There were no actions required.

6.0 Environmental Management Performance

Bulga Coal implements a comprehensive *Environmental Management Strategy* (EMS) that provides a framework for managing environmental and community impacts. It includes management plans, procedures and standards to minimise the risks of impact to the environment and continually improve the environmental management. An extensive environmental monitoring network is in place to monitor the environmental management performance of the site. The environmental monitoring network is shown in **Figure 6.1**, **Figure 6.2** and **Figure 6.3**.

Bulga Coal

FIGURE 6.1 - Bulga Coal Air and Meteorological Monitoring 2023



Legend

- Mining Lease
- Mining Lease AMA
- Rain Gauge
- High Volume Air Sampler (TSP)
- Depositional Dust Guage
- Directional Depositional Dust Gauge
- Air Quality Early Warning Unit (PM10)
- TEOM (PM10)
- BAM (PM2.5)
- Meteorological
- Main Roads
- Local Roads
- Watercourse
- Railway

GDA2020

Date Created: 18/03/2024
Map Size: A4 Landscape
Scale: 1:81,736
Map Created By: rabbott
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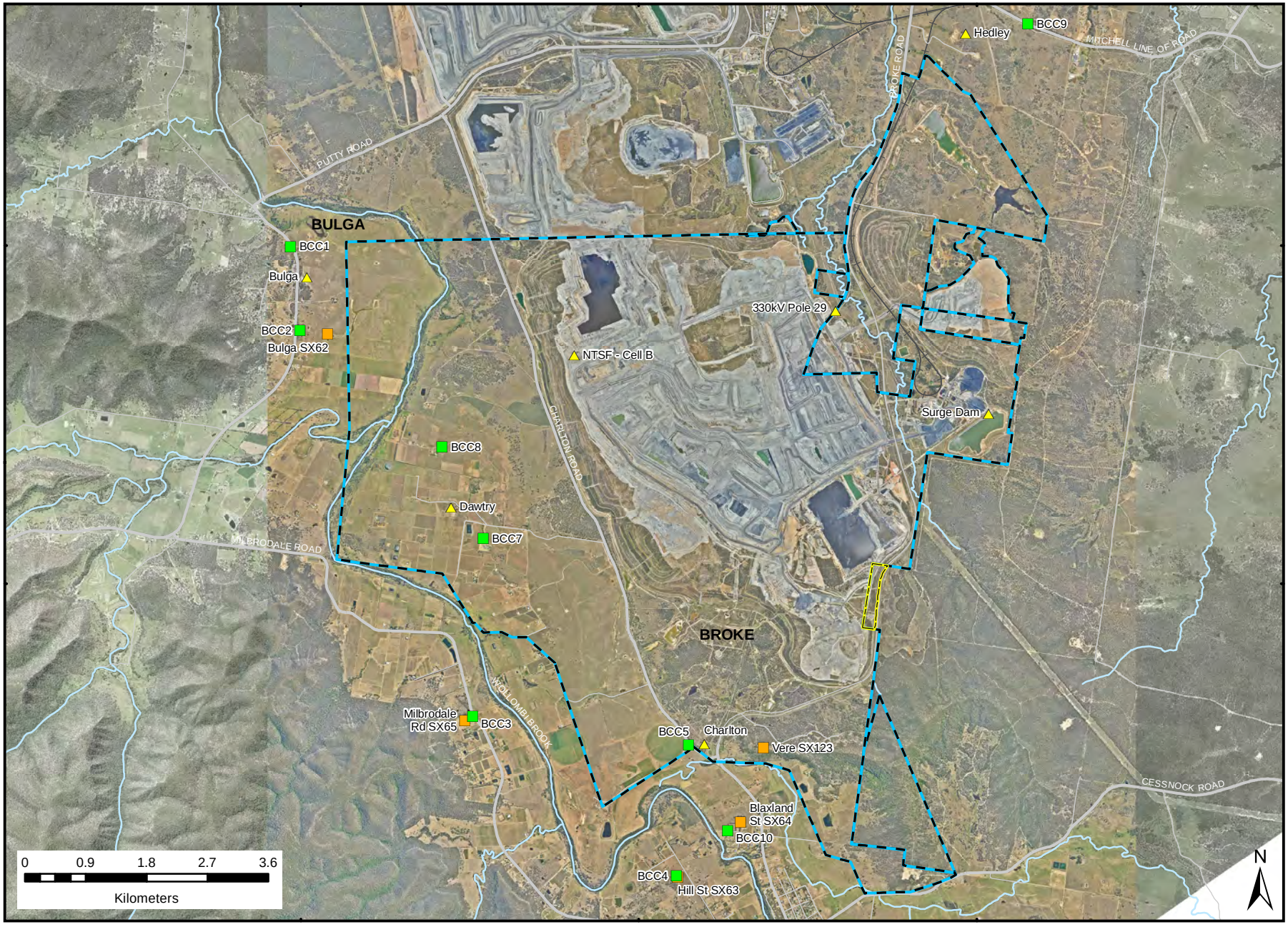
File Path Ref: Q:\03_MapDocuments\18_Reporting\Annual_Review\2023\AR FIGURES\20240201_Figure_6_1_AR_Air_Met_Monitoring_A4_GDA2020.mxd

Bulga Coal

FIGURE 6.2 - Bulga Coal Noise and Blast Monitoring 2023

GLENCORE



Legend

- Mining Lease
- Mining Lease AMA
- Attended Noise Monitoring
- Continuous Noise Monitoring
- Blast Monitoring
- Main Roads
- Local Roads
- Watercourse
- Railway

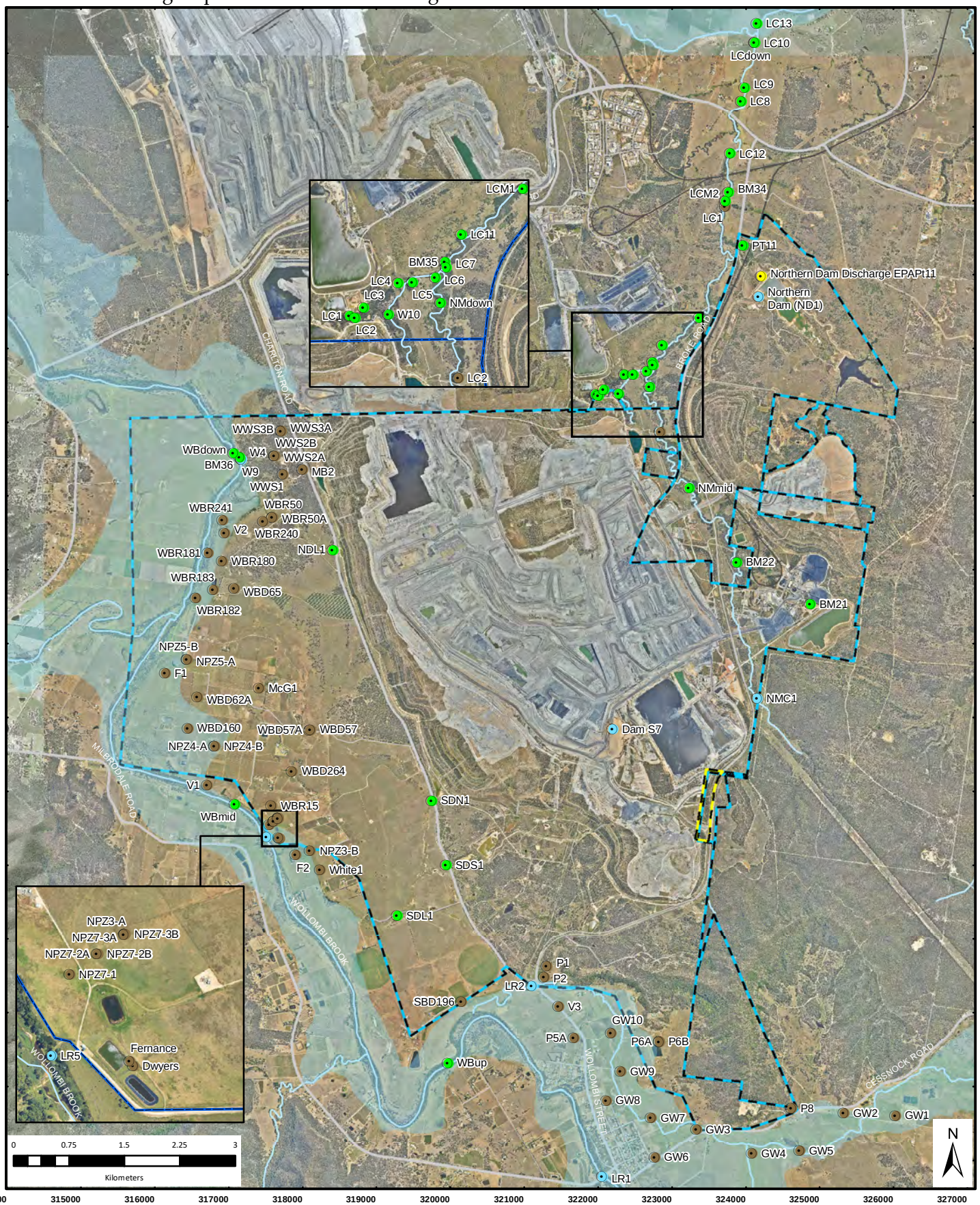
GDA2020

Date Created: 18/03/2024
Map Size: A4 Landscape
Scale: 1:80,000
Map Created By: rabbott
Coordinate System:
GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

File Path Ref: Q:\03_MapDocuments\18_Reporting\Annual_Review\2023\AR FIGURES\20240201_Figure_6_2_AR_Noise_Blast_Monitoring_A4_GDA2020.mxd

Bulga Coal

FIGURE 6.3 - Bulga Open Cut Water Monitoring 2023



Ref: Q:\03_MapDocuments\18_Reporting\Annual_Review\2023\AR FIGURES\20240201_Figure_6_3_AR_Water_Monitoring_A4_GDA2020.mxd

Legend

- Mining Lease
- Mining Lease AMA
- Wollombi Brook Alluvium
- Groundwater
- Surface Water
- EPL Discharge Point
- Stream Monitoring
- Main Roads
- Local Roads
- Watercourse
- Railway

GDA2020

Date Created: 21/03/2024
Map Size: A4 Portrait
Scale: 1:70,000
Map Created By: sjmoore
Coordinate System:
GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

6.1 Meteorology

Bulga Coal has three meteorological monitoring sites as shown in **Figure 6.1**. Meteorological data from the Bulga Complex Meteorological Station is reported in the quarterly environmental monitoring reports available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal).

In accordance with Schedule 3, Condition 23 of SSD-4960, and Condition M4 of EPL 563, Bulga continued to operate the Bulga Complex Weather Station, Southern Extension Weather Station and the Flares Weather Station.

2023 was a drier than average year with total annual rainfall at Bulga Complex Weather Station being 524 mm which was less than half than the 1,224.5 mm recorded in 2022. The average annual rainfall at Bulga is approximately 670 mm.

A summary of the annual meteorological monitoring is shown in **Table 6.1** to **Table 6.7** and **Figure 6.4** to **Figure 6.8.**

Table 6.1 Distribution of Monthly Rainfall at Representative Monitoring Stations

	January	February	March	April	May	June	July	August	September	October	November	December	Annual Total
Bulga Complex Weather Station													
Total	49	100.5	72.5	36.5	8	10.5	8.5	24	20	25	65	105	524.5
Southern Extension Weather Station													
Total	54.2	88.6	56.6	33.4	10	10	7	24.4	14.2	22.8	70	93.6	484.8
Flares Weather Station													
Total	43.5	82	60	36	12	10.5	7.5	23.5	18.5	27	73.5	83.5	477.5

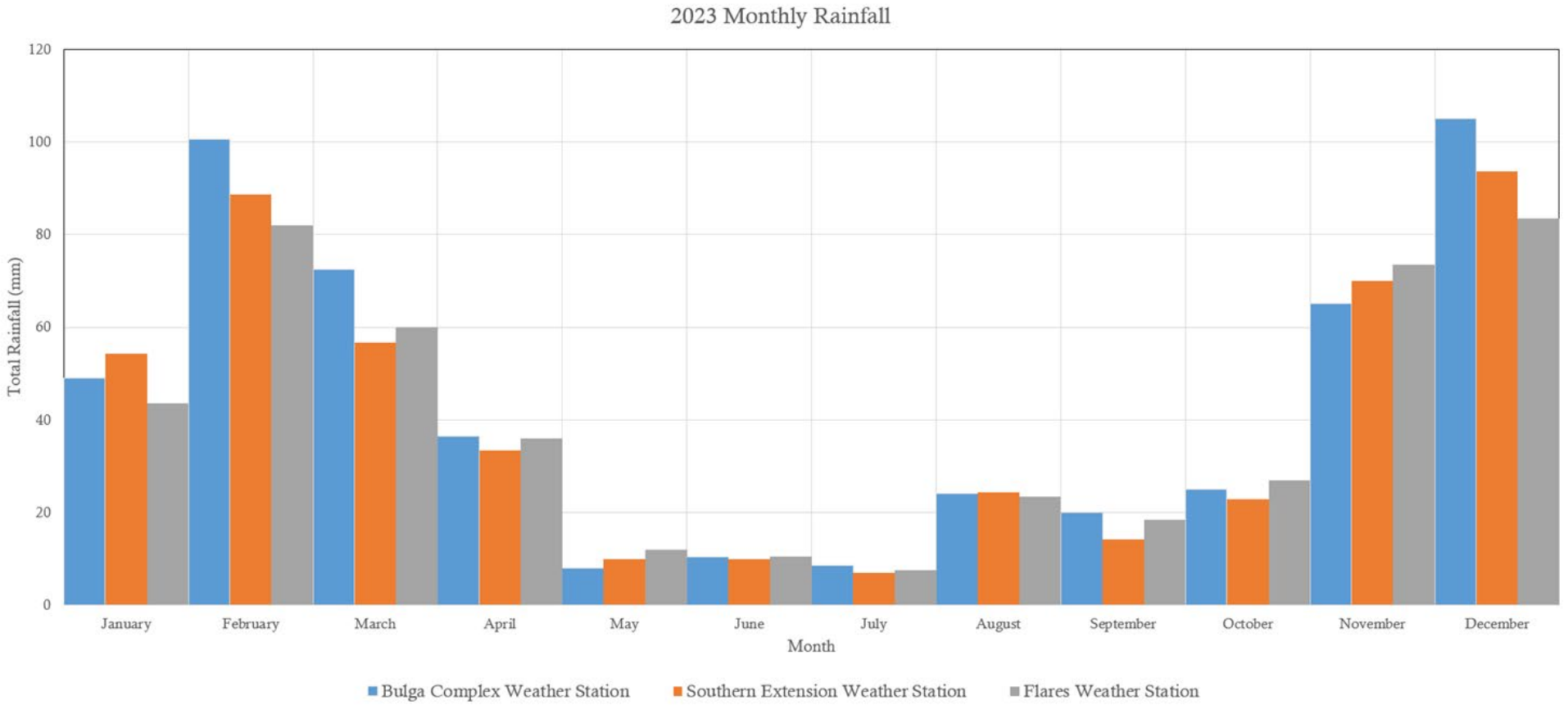


Figure 6.4 Distribution of Monthly Rainfall at Representative Monitoring Stations

As shown in **Table 6.2** and **Table 6.3**, the daily minimum and maximum surface level temperatures ranged across Bulga's three monitoring stations at 2 metres and 10 metres above surface level from –3.73°C to 44.9°C respectively. Refer to **Table 6.4** for humidity recorded over the reporting period. Relative humidity was not monitored continuously at the Flares Meteorological Station due to an equipment failure on the relative humidity sensor failing intermittently during July and August 2023; the sensor was replaced in September 2023. During November 2023 the Flares relative humidity sensor recorded erroneous data; this was identified and fixed in early December 2023.

Table 6.2 2023 Temperature 2m (Degrees Celsius) at Representative Monitoring Stations

Temperature 2 m (degrees Celsius)	Bulga Complex			Flares			Southern Extension		
Month	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
January	16.72	25.77	42.80	12.13	22.66	38.49	13.18	22.56	38.44
February	14.52	26.60	42.55	9.47	23.03	39.00	12.84	23.52	38.67
March	13.52	25.77	44.55	7.58	22.13	40.08	10.41	22.86	39.18
April	9.52	20.13	30.53	3.26	16.54	26.80	5.92	17.39	26.96
May	3.95	15.56	27.82	-2.34	10.64	23.24	1.65	12.88	23.61
June	2.12	14.40	28.53	-3.73	9.79	23.87	-0.13	11.91	23.54
July	1.61	13.45	26.35	-3.18	9.91	24.44	0.92	12.38	24.27
August	4.36	15.97	30.13	-1.83	12.01	26.40	3.32	13.79	26.34
September	6.56	20.47	37.83	0.78	15.64	34.51	5.26	17.45	34.14
October	10.69	22.45	38.23	3.73	18.64	35.16	7.35	19.60	35.06
November	14.26	24.00	40.40	7.94	20.88	37.91	11.69	21.03	38.02
December	17.12	27.41	44.90	12.57	25.18	43.52	13.75	24.44	41.56

Table 6.3 2023 Temperature 10 m/30 m (Degrees Celsius) at Representative Monitoring Stations

Temperature 10 m/30 m (degrees Celsius)	Bulga Complex (10m)			Flares (10m)			Southern Extension (30m)		
Month	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
January	15.44	23.52	39.65	12.57	22.55	37.39	14.25	22.03	36.64
February	15.05	24.59	39.47	10.46	23.13	38.06	15.59	23.32	36.65
March	12.57	23.96	41.74	8.23	22.37	39.48	11.68	22.84	38.79
April	8.97	18.37	27.80	3.98	16.90	26.52	9.12	17.51	26.00
May	3.24	14.18	24.80	-1.49	11.42	23.15	3.78	13.55	22.45
June	0.75	13.01	25.93	-2.77	10.61	23.64	2.39	12.57	23.52
July	1.39	12.02	23.44	-1.96	10.74	24.18	2.71	13.12	23.47
August	5.04	14.42	26.90	-0.66	12.58	25.68	6.26	14.27	24.88
September	5.94	18.79	35.37	2.12	16.17	34.08	6.36	17.83	33.07
October	9.72	20.60	35.67	4.44	18.85	34.78	9.41	19.52	33.82
November	13.42	22.00	37.87	9.13	20.79	37.21	12.93	20.70	35.98
December	16.11	25.35	42.39	13.03	24.20	41.03	15.21	24.05	40.30

Note: Temperature at Bulga Complex and Flares stations is at 10 m. Temperature at 30 m is recorded at Southern Extension.

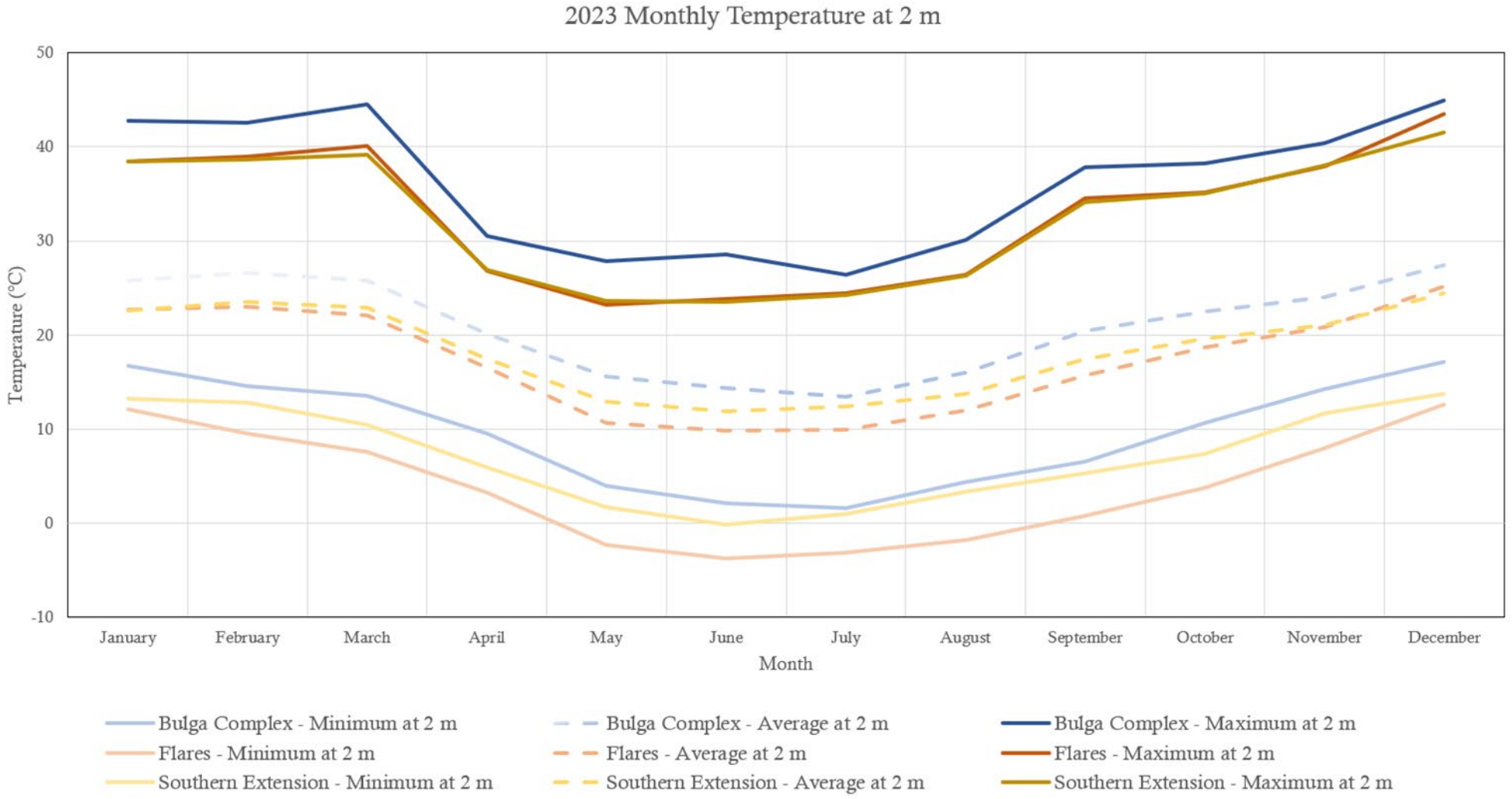


Figure 6.5 2023 Monthly Temperature 2 m (Degrees Celsius) at Representative Monitoring Stations

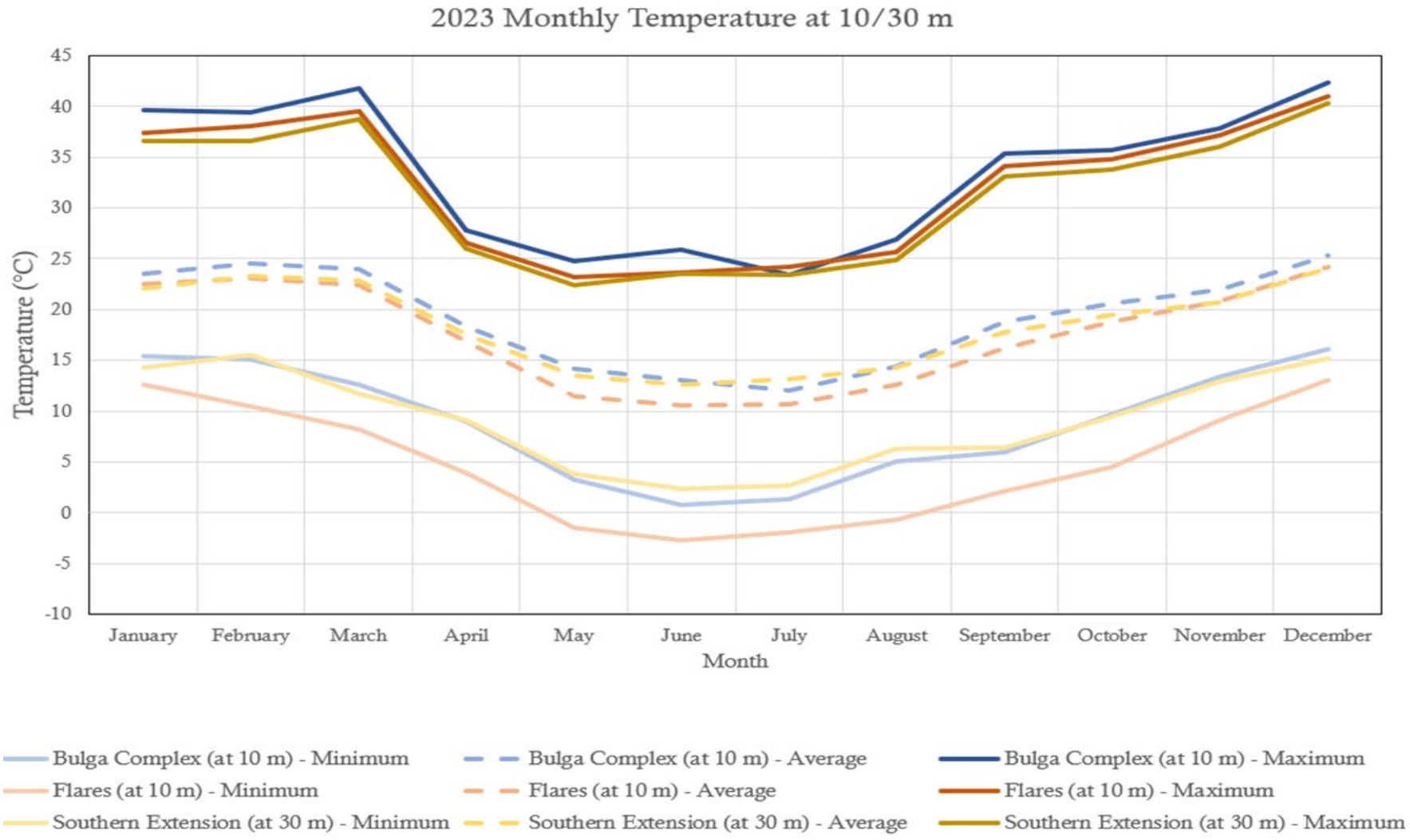


Figure 6.6 2023 Monthly Temperature 10 m/30 m (Degrees Celsius) at Representative Monitoring Stations

Table 6.4 2023 Relative Humidity (%) at Representative Monitoring Stations

Relative humidity (%)	Bulga Complex			Flares			Southern Extension		
Month	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
January	20.7	71.8	99.2	17.0	66.4	96.1	19.0	69.6	97.2
February	17.7	65.0	98.1	14.0	62.5	96.5	14.3	63.3	98.2
March	11.0	68.9	99.6	7.4	67.9	98.0	8.9	67.7	98.8
April	32.0	74.5	98.8	27.1	73.1	96.8	30.2	73.1	98.0
May	19.9	65.8	98.9	15.0	69.3	96.0	16.3	65.3	97.7
June	27.2	68.9	100.2	21.1	70.9	100.2	24.3	68.3	98.4
July	25.0	67.0	98.5	*	67.3	100.3	22.8	68.2	98.4
August	24.2	67.9	99.6	*	*	100.2	22.9	67.1	98.2
September	11.8	55.9	98.8	14.9	63.2	97.4	10.7	55.1	98.4
October	7.8	53.3	98.6	10.6	51.0	95.6	5.1	52.0	97.2
November	20.5	69.9	98.5	*	*	*	17.1	67.3	96.8
December	11.3	65.3	98.4	9.4	67.0	99.0	5.6	60.5	95.0

* Relative humidity was not monitored continuously at the Flares Meteorological Station due to an intermittent equipment failure on the relative humidity sensor from July to August 2023. The sensor was replaced in September 2023. During November 2023 the Flares relative humidity sensor recorded erroneous data; this was identified and fixed in early December 2023.

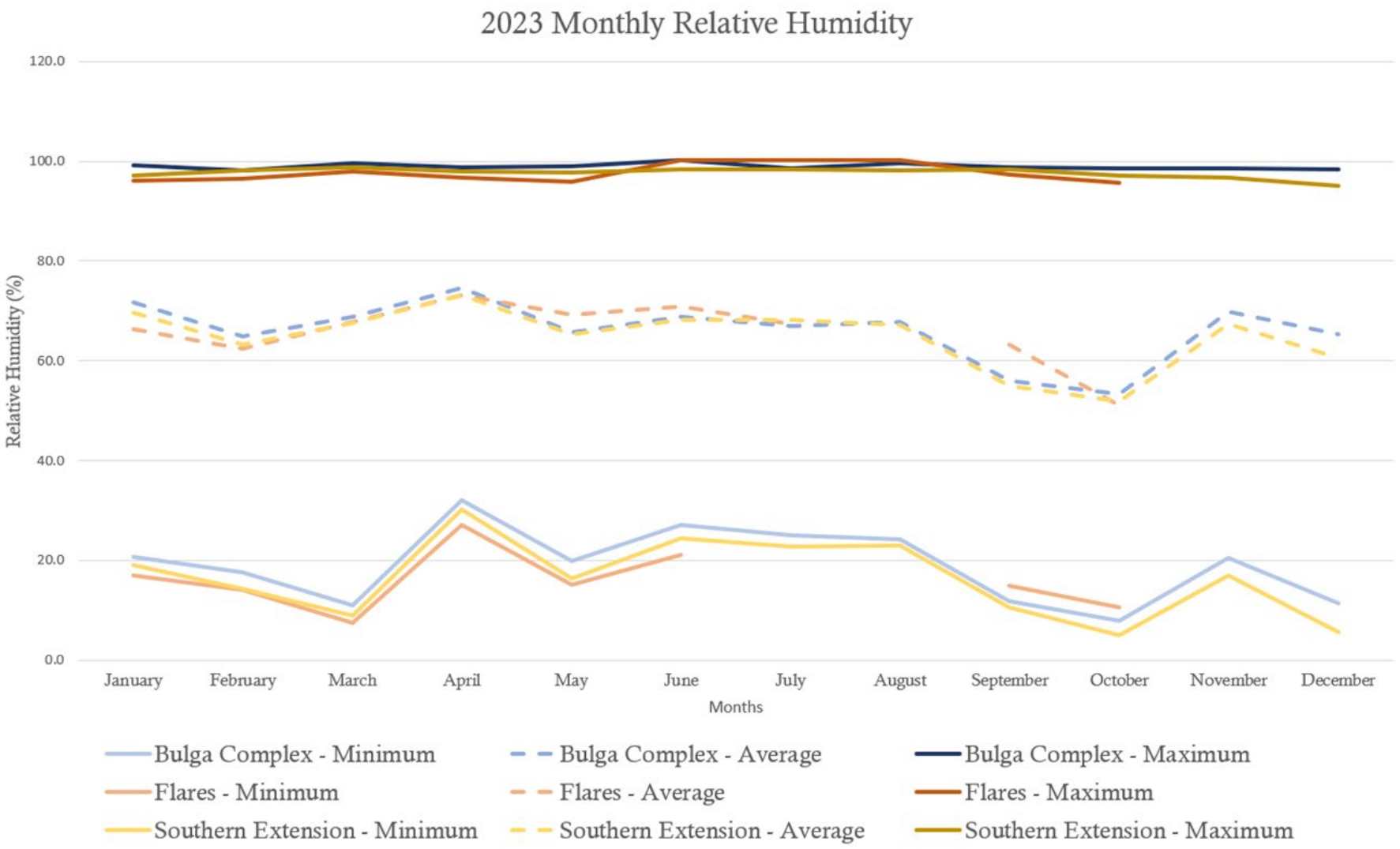


Figure 6.7 2023 Relative Humidity (%) at Representative Monitoring Stations

Table 6.5 2023 Wind Speed at Representative Monitoring Stations

Wind speed (m/s)	Bulga Complex			Flares			Southern Extension		
Month	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
January	0.0	2.8	14.0	0.0	1.6	5.8	0.3	4.5	15.1
February	0.0	2.6	15.4	0.0	1.5	8.1	0.3	4.1	20.4
March	0.0	2.4	8.2	0.0	1.3	7.4	0.1	3.7	11.1
April	0.0	2.5	8.4	0.0	1.2	6.7	0.2	4.1	12.1
May	0.0	2.4	8.7	0.0	1.0	8.3	0.2	3.7	12.2
June	0.0	2.4	8.3	0.0	1.1	7.1	0.1	3.7	13.2
July	0.0	2.4	8.6	0.0	1.1	9.0	0.2	3.7	15.0
August	0.0	2.1	10.1	0.0	1.0	8.0	0.2	3.5	13.5
September	0.0	2.5	8.5	0.0	1.4	7.8	0.1	3.9	14.4
October	0.0	3.2	11.7	0.0	2.0	8.9	0.1	4.8	15.6
November	0.0	2.4	10.6	0.0	1.7	7.7	0.1	4.0	11.4
December	0.0	2.7	9.4	0.0	1.8	7.3	0.2	4.2	13.7

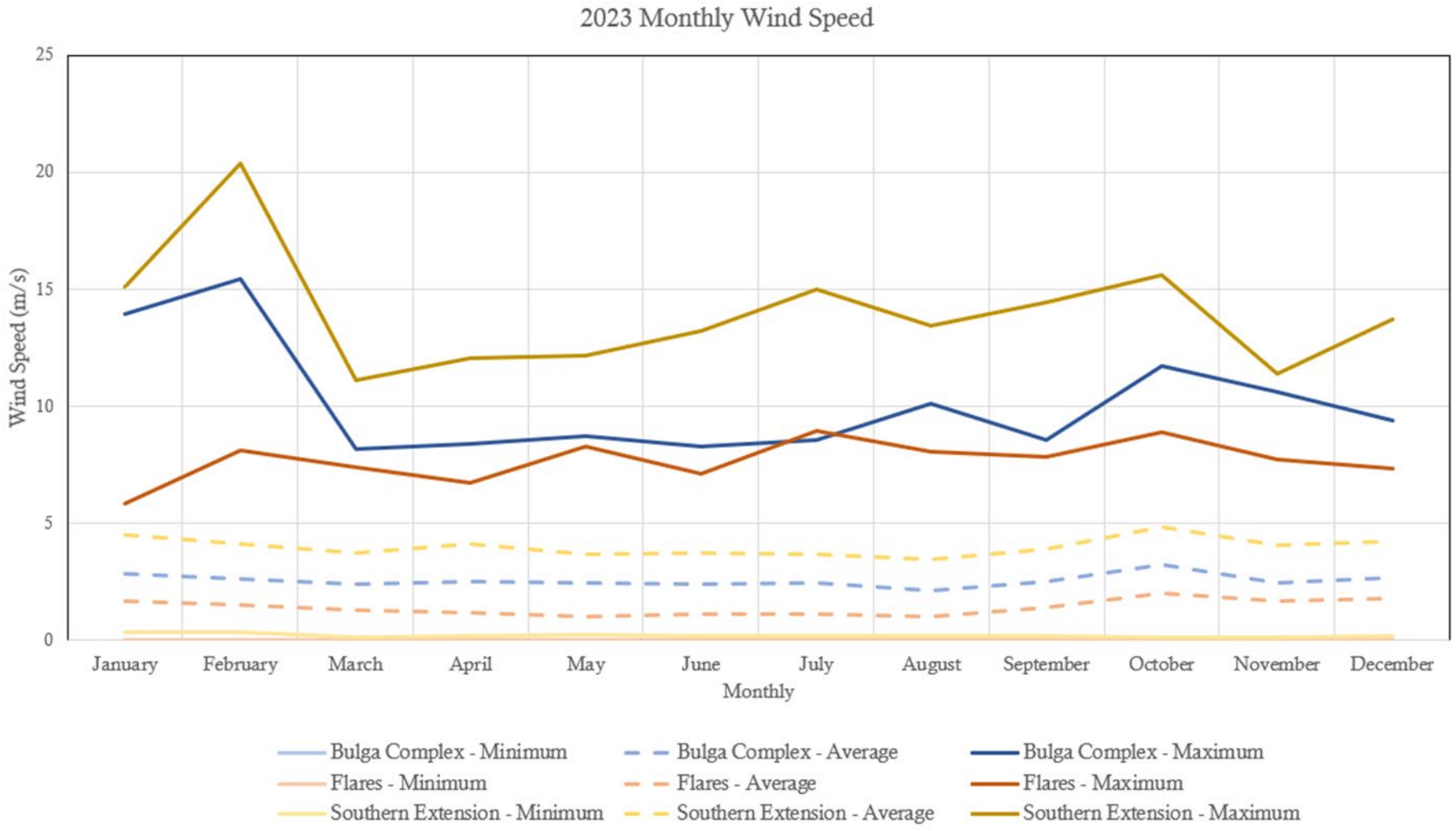


Figure 6.8 2023 Wind Speed at Representative Monitoring Stations

Table 6.6 2023 Wind Direction at Representative Monitoring Stations

Wind direction (degrees)	Bulga Complex			Flares			Southern Extension		
Month	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
January	0.0	157.3	358.8	0.0	151.7	359.5	0.2	155.7	360.0
February	0.0	170.2	359.7	0.0	152.3	360.0	0.0	170.0	359.5
March	0.0	167.3	359.0	0.0	167.0	360.0	0.0	193.7	360.0
April	0.0	160.7	360.0	0.0	175.4	359.8	0.1	193.0	359.9
May	0.0	225.0	359.7	0.0	177.3	360.0	0.1	244.1	360.0
June	0.0	222.8	358.7	0.0	185.3	360.0	0.0	247.9	359.9
July	0.0	226.2	359.3	0.0	172.2	360.0	0.0	247.2	359.8
August	0.0	189.3	359.9	0.0	157.8	359.9	0.0	202.5	359.9
September	0.0	206.7	360.0	0.0	179.5	359.9	0.0	198.1	359.9
October	0.0	208.0	359.9	0.0	186.3	359.9	0.0	205.9	359.9
November	0.0	152.7	359.9	0.0	152.8	359.9	0.0	156.2	360.0
December	0.0	173.8	359.9	0.0	163.8	359.8	0.2	174.6	359.9

Table 6.7 2023 Sigma Theta at Representative Monitoring Stations

Sigma theta (degrees)	Bulga Complex			Flares			Southern Extension		
Month	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
January	0.0	20.4	99.3	0.0	28.3	95.9	1.0	15.1	95.1
February	0.0	19.8	97.4	0.0	25.2	95.3	1.6	15.2	97.2
March	0.0	17.1	101.1	0.0	22.6	86.4	1.2	14.1	97.9
April	0.0	13.6	96.5	0.0	20.4	94.4	1.2	12.2	95.7
May	0.0	16.6	92.4	0.0	16.3	85.4	1.0	12.9	94.5
June	0.0	17.0	94.5	0.0	14.9	91.5	0.0	12.7	84.3
July	0.0	17.3	87.6	0.0	14.3	80.3	1.2	12.6	95.1
August	0.0	15.3	98.2	0.0	18.4	84.1	0.0	14.3	95.4
September	0.0	17.2	101.7	0.0	24.9	98.3	0.0	14.4	102.2
October	0.0	16.3	93.9	0.0	27.0	92.0	0.0	14.7	96.8
November	0.0	18.4	94.6	0.0	27.3	97.6	1.3	14.8	100.6
December	0.0	19.0	87.7	0.0	28.3	98.2	1.1	16.3	100.9

Wind Speed and Direction

Wind speed and direction at Bulga during 2023 has been summarised in **Figure 6.9** to **Figure 6.12**.

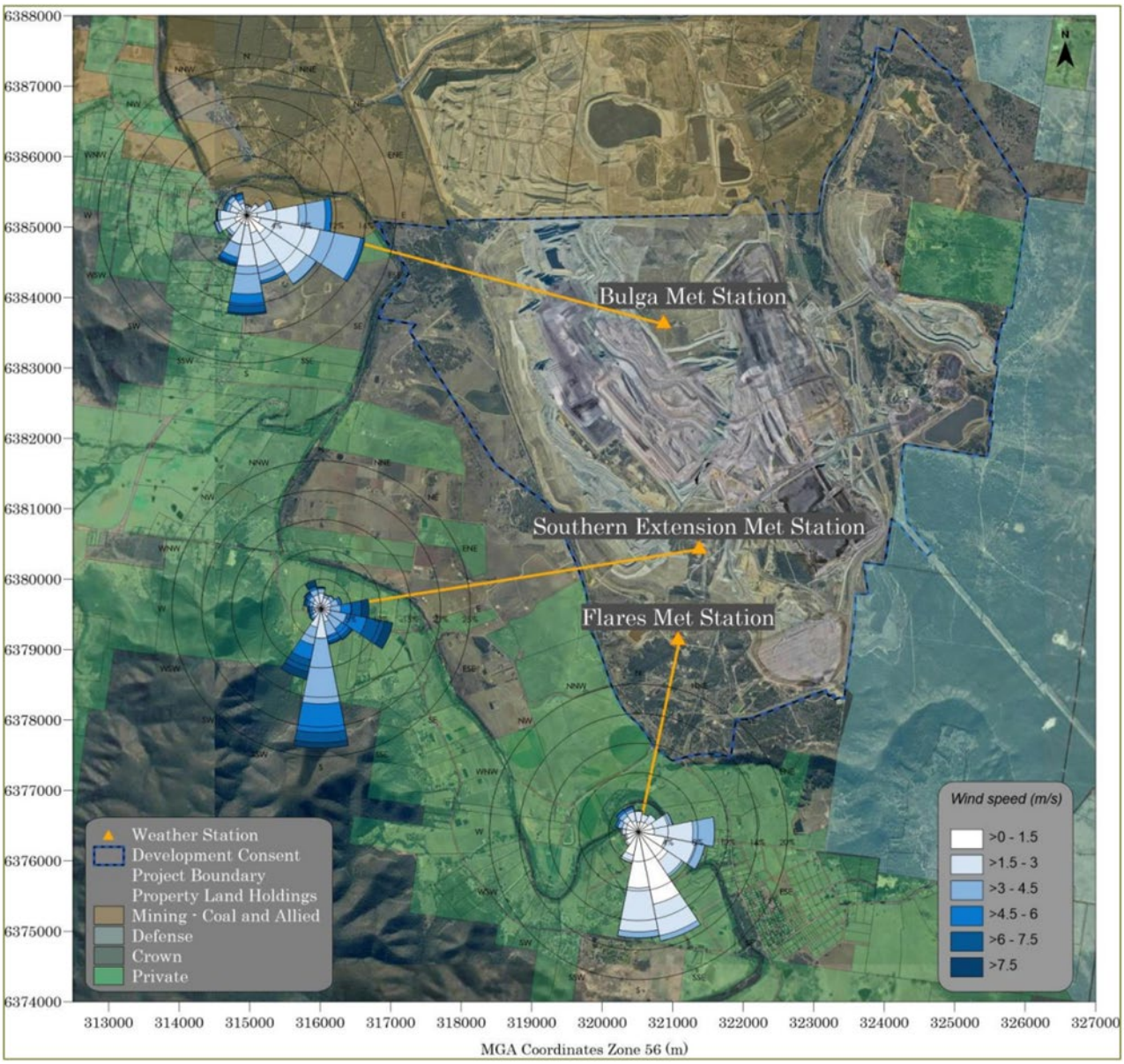


Figure 6.9 Wind Speed and Direction Quarter 1

The Bulga Meteorological Station, Southern Extension station and Flares station predominantly recorded winds originating from the southeast in Q1 2023. The calms recorded at the Flares Meteorological station were most likely due to sheltering from vegetation.

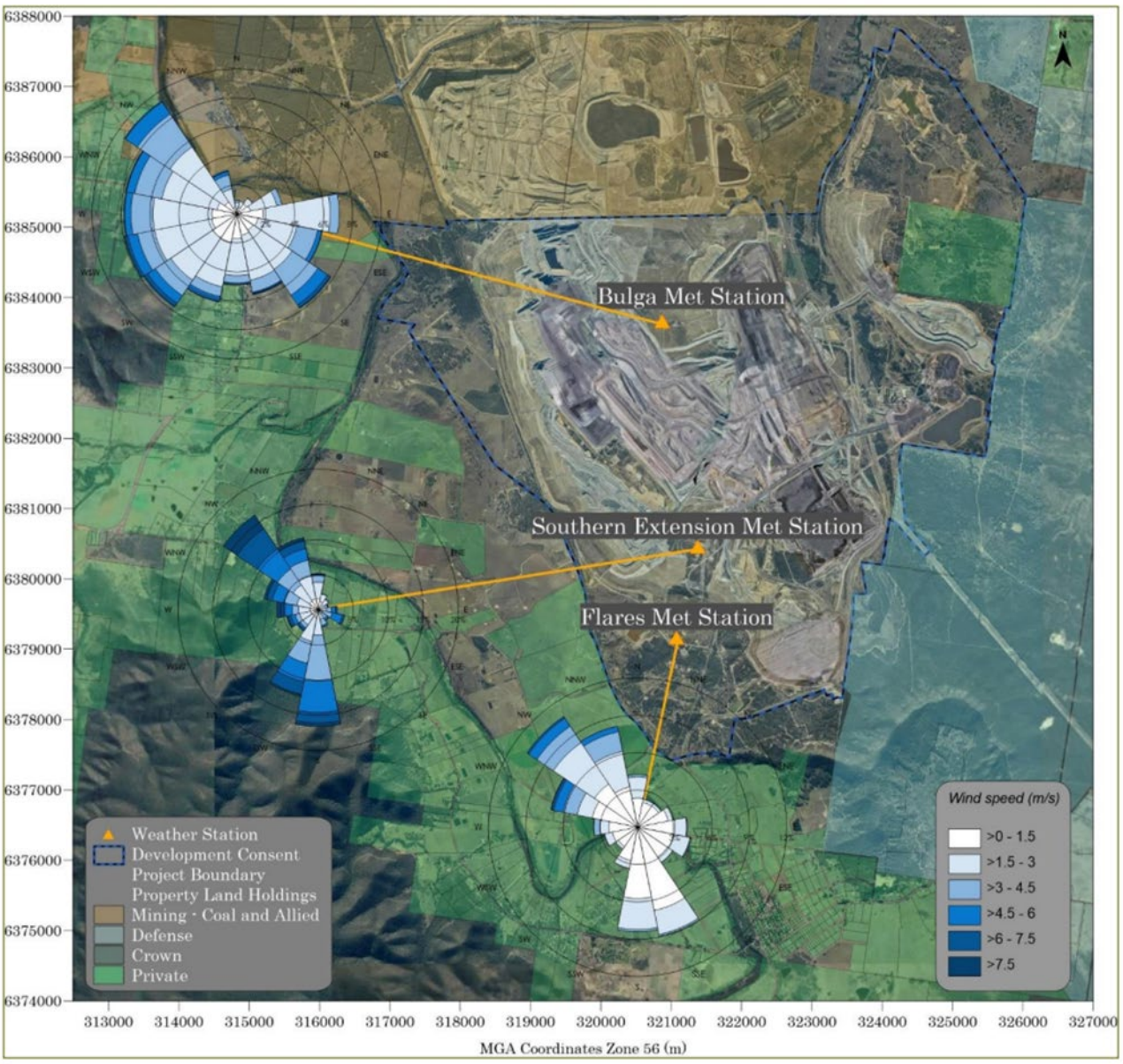


Figure 6.10 Wind Speed and Direction Quarter 2

The Bulga Meteorological Station, Southern Extension and Flares Stations recorded variable wind directions with the highest proportions being from the northwest quadrant in Q2 2023. The calms recorded at the Flares Meteorological Station were most likely due to sheltering from vegetation.

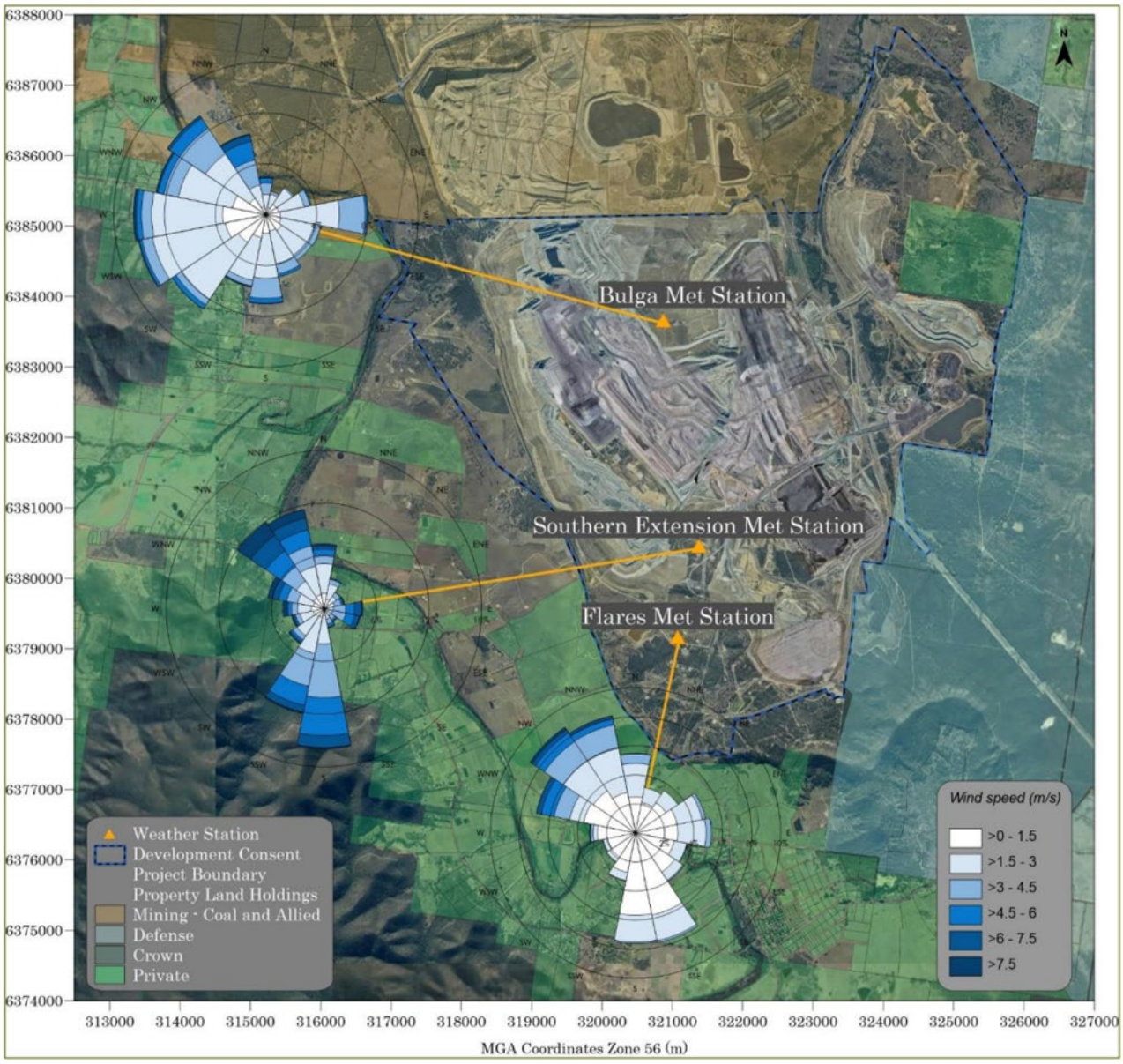


Figure 6.11 Wind Speed and Direction Quarter 3

The Bulga Meteorological Station, Southern Extension Station and Flares Station recorded variable wind directions, with highest proportions being from the northwest quadrant and south quadrant in Q3 2023. The calms recorded at the Flares Meteorological Station were most likely due to sheltering from vegetation. It is noted that the readings recorded by the Bulga Meteorological Stations wind direction sensor were impacted by an insect infestation during Q3. The sensor was replaced on 18 August 2023.

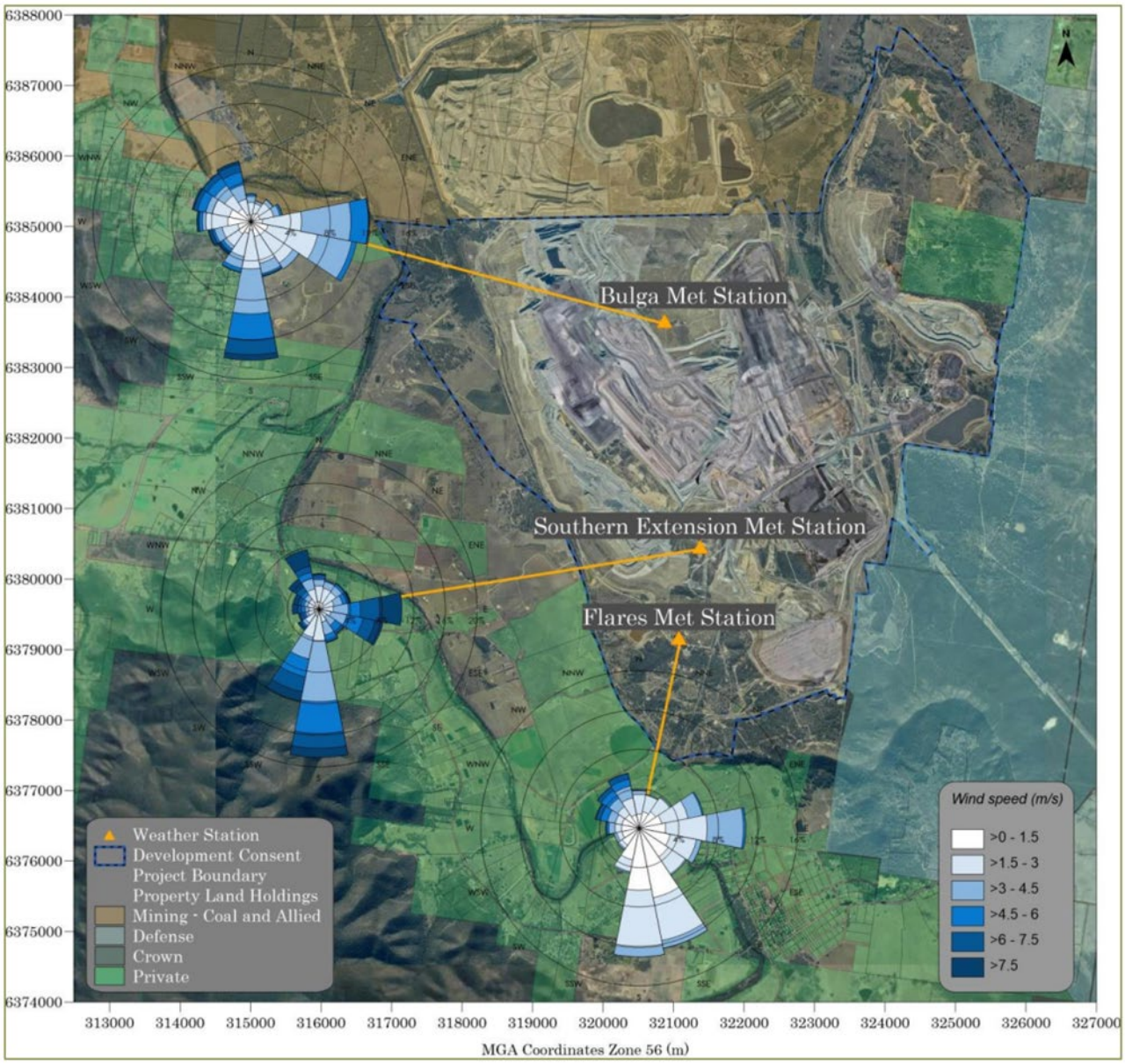


Figure 6.12 Wind Speed and Direction Quarter 4

The Bulga Meteorological Station, Southern Extension station and Flares station recorded variable wind directions with the highest proportions being from the south in Q4 2023. The calms recorded at the Flares station were most likely due to sheltering from vegetation.

6.2 Noise

6.2.1 Environmental Management

Noise monitoring is undertaken in accordance with the *Bulga Coal Noise Management Plan*.

The location of noise monitoring sites is shown on **Figure 6.2**. The monitoring program includes:

- monthly attended night-time monitoring at nine locations
- real-time monitoring at four locations
- sound power testing of a representative sample of the open cut fleet
- additional monitoring as initiated by alarms or in response to community concerns.

The real-time monitoring network assists with the management of noise impacts from mining operations. Monitors are operated at locations representative of Broke, Fordwich, Milbrodale and Bulga. Data is recorded continuously and reported real-time to the Bulga Open Cut control room via an internal website. Dispatch is notified of noise levels that are approaching or exceeding the Development Consent noise criteria. Return to work alarms are implemented to alert Dispatch to a change to non-noise enhancing weather conditions. Dispatch and Open Cut Examiners (OCE) investigate noise sources and make changes to reduce noise, where required. The noise criteria is found in Appendix 6 of SSD-4960 and shown in **Table 6.8**. Compliance with this criteria was assessed in attended monitoring during 2023.

Sound power testing involves testing a representative sample of the open cut fleet annually. Every item of mobile equipment is tested at least once every three years. Measured sound power levels are compared to levels included in the *Bulga Surface Operations Eastern Emplacement Area Modification Statement of Environmental Effects* (SEE) dated July 2016, including the *Bulga Surface Operations Eastern Emplacement Area Modification Response to Submissions* (RTS) dated December 2016. Individual items that exceed specified levels by 3 dB or more are investigated to assess the cause of the exceedance. Defects are rectified as soon as practicable.

The total measured fleet-wide (logarithmic) averages of mobile plant for the current sound power testing campaign are calculated annually. The total measured fleet averages should remain equal to or less than 2 dB of the relevant modelled fleet averages.

6.2.2 Environmental Performance

Attended Noise Monitoring

A summary of attended noise monitoring data for each monitoring location (**Figure 6.2**) is shown in **Table 6.8**. Results are presented as the maximum noise levels from Bulga Coal at each location during 2023. A detailed discussion of monitoring results is provided in monthly noise monitoring reports available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/monitoring-documents). Bulga Coal were generally compliant with the *Noise Management Plan*, details of exceedances have been presented below and in **Section 11.1**.

Table 6.8 Summary of Attended Noise Monitoring Data – 2023

Location	Bulga Coal Noise Monitoring Results – dBA (Max)		Bulga Coal Project Specific Noise Criteria – dBA	
	LAeq(15minute)	LA1(1minute)	LAeq(15minute)	LA1(1minute)
BCC1 (Bulga Village)	31	40	35	45
BCC2 (2241 Putty Road)	35	41	35	
BCC3 (803 Milbrodale Road)	34	**46**	35	
BCC4 (115 Hill Street)	34	38	35	
BCC5 (Broke Cemetery)	34	43	35	
BCC7 (179 Cobcroft Road)	**40**	45	36	
BCC8 (154 Cobcroft Road)	**42**	**48**	36	
BCC9 (Mitchell Line Road)	29	35	35	

Exceedances recorded during the attended noise monitoring included:

BCC3 – 803 Milbrodale Road

- A 1 dB exceedance of the LA1 (1 minute) noise criterion was recorded on the 18 January 2023. This was mainly caused by engine surges. Dispatch was notified and a follow up noise measurement was undertaken within 75 minutes. Noise levels were compliant during the follow up measurement.

BCC7 – 179 Cobcroft Road

- A 1 dB exceedance of the LAeq (15 minute) noise criterion was recorded on 6 November 2023. This was mainly caused by the mining continuum. A remeasurement recorded a 2 dB exceedance of the LAeq (15 minute), plus a 2 dB low frequency modifying factor resulting in a 4 dB exceedance. The exceedance was caused by the mining continuum. During the follow up remeasurement on 10 November 2023, LAeq (15 minute) were 27 dB and LA1 (1 minute) were 33 dB; both levels were compliant. The non-compliance was reported to the DPHI on 7 November 2023, followed by an investigation report (also refer to **Section 11.1**).

BCC8 – 154 Cobcroft Road

- A 6 dB exceedance of the LAeq (15 minute) noise criterion and a 3 dB exceedance of the LA1 (1 minute) noise criterion was recorded on 4 May 2023. This was mainly caused by mine continuum and engine surge noise. Dispatch was notified and a follow up noise measurement was undertaken within 75 minutes. Noise levels were compliant during the follow up measurement.

Mobile Plant Sound Power Testing

2023 was the second year of the new three-year testing cycle (2022 – 2024). During the reporting period 2023 sound power testing was undertaken by EMM Consulting Pty Ltd (EMM, 2024). During the second year of the 3-year testing cycle (2022 and 2023) measurements were taken on 75 items of mobile plant, which corresponds to 64% of the entire fleet.

Average sound power levels across the make/model mobile plant tested in 2023 were within 2 dB of the noise targets, except for the larger Hitachi and CAT excavators; the larger excavator fleet average was +4 dB (L_w) and +1 dBA (L_{WA}) above modelled levels; individual items that did not meet the targets will be inspected. Total sound power will be calculated at the conclusion of the three-yearly testing campaign. The exceedance from the larger Hitachi/CAT excavators was caused by the Hitachi EX5600; which was removed from operations in 2023. The remaining equipment from the larger Hitachi/CAT excavators were compliant with the modelled levels.

Sound attenuation packages on trucks are inspected every three to four weeks and replaced every four years. Some variation across the fleet is expected as individual units will be at different stages of their build cycle.

Individual items of plant that did not meet the targets by more than 3 dB will be inspected and defects fixed, where required. Corrective actions for plant that exceeded the sound power targets by 3 dB or more during 2023 are listed below:

- The D11T will be inspected and defects fixed, if required.
- The Water Cart noise attenuation components will be inspected and replaced, as required.
- A number of components on the 793C/D haul trucks will be inspected and replaced.
- A number of components on the 789D haul trucks will be inspected and replaced.

6.2.3 Comparison Against Predictions

The *Noise Impact Assessment for the Bulga Optimisation Project – Eastern Emplacement Area Development Consent Modification* (Global Acoustics, 2016) predicted Bulga Coal only noise levels from reasonable worst-case operating conditions throughout the life of the open cut mine. Modelling was done for Year 4 of the Bulga Optimisation Project. *The Bulga Extension Project Noise Impact Assessment* (Global Acoustics, 2019) and the *Bulga Extension Project Noise Impact Assessment* (Global Acoustics, 2019b) (for Modification 3) stated the modification would comply with approved noise limits at all receptor locations throughout the mining progression with an appropriate level of noise mitigation applied during periods of adverse meteorological conditions. Therefore, the existing predictions remain the same.

As noted in **Section 6.2.2**, attended monitoring results in 2023 recorded one non-compliance with SSD-4960 noise criteria. An additional three exceedances occurred during 2023, which were deemed within criteria after follow-up measurements had been taken (refer **Section 6.2.2**). This shows that measured noise levels were managed in accordance with the Noise Management Plan and generally below reasonable worst-case night-time predictions made for the Bulga Optimisation Project.

6.2.4 Long Term Analysis

Table 6.9 shows the number of noise criteria exceedances recorded by Bulga Coal during the period from 2011 to 2023.

Table 6.9 Summary of Exceedances by Noise Monitoring Location 2011-2023

Location	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
BCC1	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
BCC2	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
BCC3	0	0	0	0	0	0	0	1	0	0	0	0	1	**2**
BCC4	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
BCC5	0	0	0	0	1	0	1	2	0	0	2	0	0	**6**
BCC6	0	0	0	0	0	1	0	-[1]	-[1]	-[1]	-[1]	-[1]	-[1]	**1**
BCC7	0	1	0	0	0	4	0	1	0	0	0	0	2	**8**
BCC8	0	0	0	0	0	0	0	0	0	0	0	4	2	**6**
BCC9	-[1]	-[1]	-[1]	-[1]	-[1]	-[1]	0	0	0	0	0	1	0	**1**
BCC10	-[1]	-[1]	-[1]	-[1]	-[1]	-[1]	-[1]	1	0	0	0	0	0	**1**
Total	**0**	**2**	**0**	**0**	**1**	**5**	**1**	**6**	**0**	**0**	**2**	**5**	**5**	**27**

[1] Noise levels no longer monitored at this location.

As indicated in **Table 6.9**, occasional exceedances of the Bulga Coal noise criteria have been recorded during the period from 2011 to 2023.

6.2.5 Implemented/Proposed Improvements

The Noise Management Plan was revised in February 2022 and was approved on 9 March 2022 by DPHI.

Changes to Noise Monitoring or Management

No changes to the noise monitoring network were carried out during 2023.

Continuous Improvement

Continuous improvement to noise management during 2023 included:

- Individual items of plant that did not meet the targets by more than 3dB will be inspected and defects fixed, if required.
- Introduction to site of 13 Komatsu 930E haul trucks which have sound power levels of approximately 113 dBA which is approximately 2 dB less than the Cat 793 trucks they are replacing.
- Approval to acquire and commission in 2024 6 additional new Komatsu 930E haul trucks, to replace Cat 793 trucks.

6.3 Blasting

6.3.1 Environmental Management

Blasting is undertaken in accordance with the *Blast Management Plan*. Monitoring is carried out to assess air blast overpressure and ground vibration impacts to the nearest privately owned residents.

Private property blast impact assessment criteria are provided in **Table 6.10**. The criteria compliance monitoring locations (Dawtrey, Bulga, Charlton and Hedley) are shown in **Figure 6.2**.

Table 6.10 Private Property Amenity Impact Assessment Criteria

Air blast Overpressure Level (Db(Lin Peak))	Ground Vibration Peak Particle Velocity (ppv)	Allowable Exceedance
115	5 mm/s	5% of the total number of blasts over a period of 12 months
120	10 mm/s	0%

Blasting is managed to minimise ground vibration at public infrastructure. Infrastructure impact assessment criteria are provided in **Table 6.11**. Vibration monitoring is undertaken when the predictions from the scaled distance model are greater than or equal to 80% of the criteria. During the year, monitoring was undertaken at Pole 29 of the 330 kV powerline as shown in **Figure 6.2**.

Table 6.11 Infrastructure Impact Assessment Criteria

Infrastructure	Ground Vibration peak particle velocity (ppv)	Allowable Exceedance
330 kV Suspension Towers, Private Irrigation District (PID) Pipeline and public roads	100 mm/s	0%
Declared dams	50 mm/s	0%
All other public infrastructure	50 mm/s	0%

Heritage blast vibration impact assessment criteria are listed in **Table 6.12**. The Bulga, Charlton and Dawtrey blast monitors shown in **Figure 6.2** are used to assess compliance.

Table 6.12 Heritage Impact Assessment Criteria

Heritage Site	Ground vibration ppv	Allowable Exceedance
'Mt Leonard Homestead', BH14 – 'Charlton', B13 – Stone Wall alongside Monkey Place Creek, St Andrews Anglican Church, BH6 – Broke Cemetery, Murinbin House Group.	5 mm/s	0%

6.3.2 Environmental Performance

182 blasts from Bulga Open Cut were recorded during 2023. Monitoring data is available on the Bulga Coal website, with a summary provided in **Table 6.13** to **Table 6.15**. During 2023 no blast exceeded the overpressure or ground vibration exceedance criteria.

Table 6.13 2023 Private Property Overpressure and Vibration Monitoring Results

Monitoring Location	Airblast Overpressure Level dBL (Lin Peak)				Ground Vibration ppv (mm/s)			
	Average	Max	Results >115 dBL	Results >120 dBL	Average	Max	Results >10 mm/s	Results >5 mm/s
Bulga	94.3	113.2	0 (0%)	0 (0%)	0.1	1.4	0 (0%)	0 (0%)
Charlton	90.6	109.1	0 (0%)	0 (0%)	0.2	1.52	0 (0%)	0 (0%)
Dawtrey	93.0	115.0	0 (0%)	0 (0%)	0.2	0.8	0 (0%)	0 (0%)
Hedley	92.2	110.1	0 (0%)	0 (0%)	0.1	0.49	0 (0%)	0 (0%)

Table 6.14 2023 Infrastructure Vibration Monitoring Results

Monitoring Location	Ground Vibration ppv (mm/s)		
	Average	Max	Results > 100 mm/s
330 kV Pole 29	0.09	11.75	0 (0%)

Table 6.15 2023 Declared Dam (Northern Tailings Facility) Vibration Monitoring Results

Monitoring Location	Ground Vibration ppv (mm/s)		
	Average	Max	Results > 50 mm/s
Portable Blast NTSF B	0.16	2.84	0 (0%)
Surge Dam	0.43	1.95	0 (0%)

The Surge Dam monitor was installed in March 2023 as the mine progression continued south and east. Ground vibration results from the blast monitor are presented in **Table 6.15**.

6.3.3 Comparison Against Predictions

A *Blasting Noise and Vibration Impact Assessment* (Wilkinson Murray, 2012) was undertaken as part of the Bulga Optimisation Project EIS. The assessment noted that blasting would be managed to meet the amenity air blast and vibration criteria identified for inclusion in the Development Consent and EPL. The results are consistent with predictions.

6.3.4 Implemented/Proposed Improvements

In 2023 Bulga Open Cut commenced works for the implementation of an SMS verification system to replace the blast authorisation spreadsheet. The SMS system will assess the blast details (size, location, design) together with current meteorological data from site; this information will feed the blast model and provide a Yes/No output to approve or delay the blast.

Changes to monitoring included the commissioning of the Surge Dam blast monitor.

6.4 Air Quality

6.4.1 Environmental Management

Bulga Coal implements controls to mitigate air quality impacts in accordance with the *Eastern Emplacement Area Management Framework* (EEAMF) and the *Air Quality and Greenhouse Gas Management Plan* (AQGGMP). The AQGGMP was revised in 2020 for SSD-4960 Modification 3 and DA 376-8-2003 Modification 7 and was approved by DPHI on 9 May 2022.

Bulga Coal operates a monitoring network to assess air quality impacts on surrounding communities. The monitoring network (refer **Figure 6.1**) consists of:

- Air quality monitors required by the relevant consents:
    - Eleven Dust Deposition Gauges (DDGs) (four of which are directional) used for monitoring of larger dust particles (typically >50 micrometres [µm]). DDGs are sampled monthly (+/- 2 days) and results include the insoluble (mineralogical) matter (IM) and ash residue (organic).
    - Three High Volume Air Samplers (HVAS) that monitor Total Suspended Particulates (TSP) over a 24-hour period every sixth day, known as D10, Dawtrey and Hill Street monitors.
    - Five Tapered Element Oscillating Microbalance (TEOM) continuous air quality monitors that measure the concentration of PM_{10}, located at Putty Road (D3), Dawtrey (D5), Hill Street (D1), Mitchell Line Road (D11) and the Mushroom Composting Facility (D4).
    - Two Beta Attenuation Monitors (BAM) located at Hill Street (D2) and Putty Road (D10) that measure the concentration of particulate matter less than 2.5µm in diameter ($PM_{2.5}$).
- Air quality monitors required by EPL 563:
    - Two E-BAM monitors continuously measuring PM_{10}, at EPL Point 9 and EPL Point 10 at the north-west and south-east of the EPL premises, respectively.

6.4.2 Environmental Performance

The environmental performance presented below includes the data from the Bulga Coal monitors including DDGs, HVAS, TEOMs, BAMs and E-BAMs.

Table 6.16 presents the SSD-4960 Mod 3 air quality criteria.

Table 6.16 Air Quality Criteria SSD-4960 Mod 3

Pollutant	Averaging Period	Criterion	
Particulate Matter <10 µm (PM_{10})	Annual	[a,c] 25 µg/m^3	
	24-hour	[b] 50 µg/m^3	
Particulate Matter <2.5 µm ($PM_{2.5}$)	Annual	[a,c] 8 µg/m^3	
	24-hour	[b] 25 µg/m^3	
Total Suspended Particulates (TSP)	Annual	[a,c] 90 µg/m^3	
[d] Deposited Dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

[a] Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

[b] Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

[c] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed to by the Planning Secretary.

[d] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.

In 2023, there were no days declared as "extraordinary air quality events" by DPHI.

Depositional Dust Monitoring

Depositional dust monitoring results are summarised in **Table 6.17**. Monitoring results are available on the Bulga Coal website.

Table 6.17 Summary of Dust Deposition Monitoring Results – 2023 Annual Average

Offsite Gauge		IM Deposited (g/m^2/mth)	Ash Residue (g/m^2/mth)	Adopted Consent Criteria (g/m^2/mth)
Code	General Location			
A3	Inlet Road	3.63	1.8	4.0
C5 (DR[1])	Mount Eyre Vineyard	0.92	0.6	
D6	Howe Street	2.4	1.2	
D9	Inlet Road	1.4	1.0	
D10	Putty Road	1.94[2]	1.0	
F3 (DR[1])	Fordwich	0.9	0.6	
N5 (DR[1])	Putty Road	1.7	0.9	
Redibar	Redibar	0.7	0.3	
Sharrock 1	Sharrock	0.8	0.4	
Hedley	Mitchell Line Road	2.0	1.2	
F2 (DR[1])	Cobcroft Rd	1.0	0.6	

[1] Indicates Directional Depositional Dust Monitor.

[2] Fourth monthly samples deemed to be contaminated from excessive bird droppings.

There were no exceedances of the depositional dust criteria during 2023. There was an increase in the monthly deposited dust levels across most sites during 2023 compared with previous years, likely due to the hotter, and lower rainfall conditions experienced throughout 2023.

High Volume Air Sampling

Table 6.18 presents a summary of monitoring results and compares annual averages for TSP against consent criteria. Results include dust from mine (including neighbouring operations) and non-mine sources and are not attributable to Bulga Coal only.

Annual averages were below the relevant criteria at all locations in 2023.

Table 6.18 Summary of 2023 HVAS Annual Average Results

Gauge	Annual Average (µg/ m^3) (excluding extraordinary events)
	TSP (µg/ m^3)
Consent Criteria	90
Dawtrey	30.5
Putty Road (D10)	31.8
Hill Street (D2)	22.2

Continuous Monitoring – PM_{10}

A summary of the recorded PM_{10} levels at the TEOM units is presented in **Table 6.19**.

The annual PM_{10} averages were below the criterion of 25 µg/m^3 at all monitoring locations, Hill St (D1), Putty Rd (D3), Dawtrey (D5) and Mitchell Line Rd (D11).

The maximum 24-hour PM_{10} were higher than 2022 at all sites which can likely be attributed to hotter and dryer than average conditions in 2023. During 2023 three days recorded an exceedance of the 24-hour average criterion. Exceedances recorded during September and October 2023 were investigated and results indicated that Bulga contributed to less than 50 µg/m^3.

Table 6.19 Summary of TEOM 2023 Monitoring Results

Gauge	Annual Average PM_{10} (µg/m^3)		Maximum 24-hour Average PM_{10} (µg/m^3)	
	PM_{10} (µg/m^3) [1]	Number of days exceeding criterion	PM_{10} (µg/m^3) [1]	Number of days exceeding criterion
Consent Criteria	25	-	50	-
Hill Street (D1)	13.6	-	42.0	-
Putty Road (D3)	16.2	-	45.2	-
Dawtrey (D5)	16.2	-	61.9	1
Mitchell Line Road (D11)	18.4	-	60.3	2

[1] Excluding extraordinary events.

Continuous Monitoring – $PM_{2.5}$

Table 6.20 presents a summary of the recorded $PM_{2.5}$ levels at the BAM monitors.

The annual $PM_{2.5}$ averages were below the relevant criterion of 8 µg/m^3 at D2 (Hill St) and D10 (Putty Rd).

The maximum 24-hour $PM_{2.5}$ averages were below the relevant criterion of 25 µg/m^3 during 2023. During 2023 $PM_{2.5}$ recorded an increase compared to 2022. This increase can likely be attributed due to the hotter and dryer than average conditions recorded in 2023.

Table 6.20 Summary of BAM 2023 Monitoring Results

Gauge	Annual average $PM_{2.5}$ (µg/m^3)		Maximum 24 hour average $PM_{2.5}$ (µg/m^3)	
	$PM_{2.5}$ (µg/m^3)	Number of days exceeding criterion	$PM_{2.5}$ (µg/m^3)	Number of days exceeding criterion
Consent Criteria	8	-	25	-
Putty Road (D10)	5.2	-	19.8	-
Hill Street (D2)	4.8	-	18.1	-

Onsite EPL Monitors

In accordance with the requirements of EPL 563, Bulga Coal operated two E-BAM type continuous air quality (PM_{10}) monitors close to the EPL premises boundary.

The data is analysed with wind speed and wind direction data to estimate the Bulga Coal PM_{10} contribution at each location. The monitors are not used to assess compliance with the air quality criteria in the Development Consent; they inform the Bulga Open Cut Air Quality Trigger Action Response Plan (TARP). Alarms are generated in the control room when elevated PM_{10} levels occur. Actions to minimise dust are taken in response to alarms, where required.

Figure 6.13 and **Figure 6.14** present the pollution roses for EPA Point 9 and EPA Point 10 monitors, respectively. The figures show that there is a slight effect on dust levels from the direction of Bulga Coal. Some high levels occur in the direction of Bulga Coal at the EPA Point 9 (D9) monitor given the location is close to mining activities, however the monitor recorded a greater proportion of high levels when winds were from the northwest quadrant which is upwind of Bulga Coal.

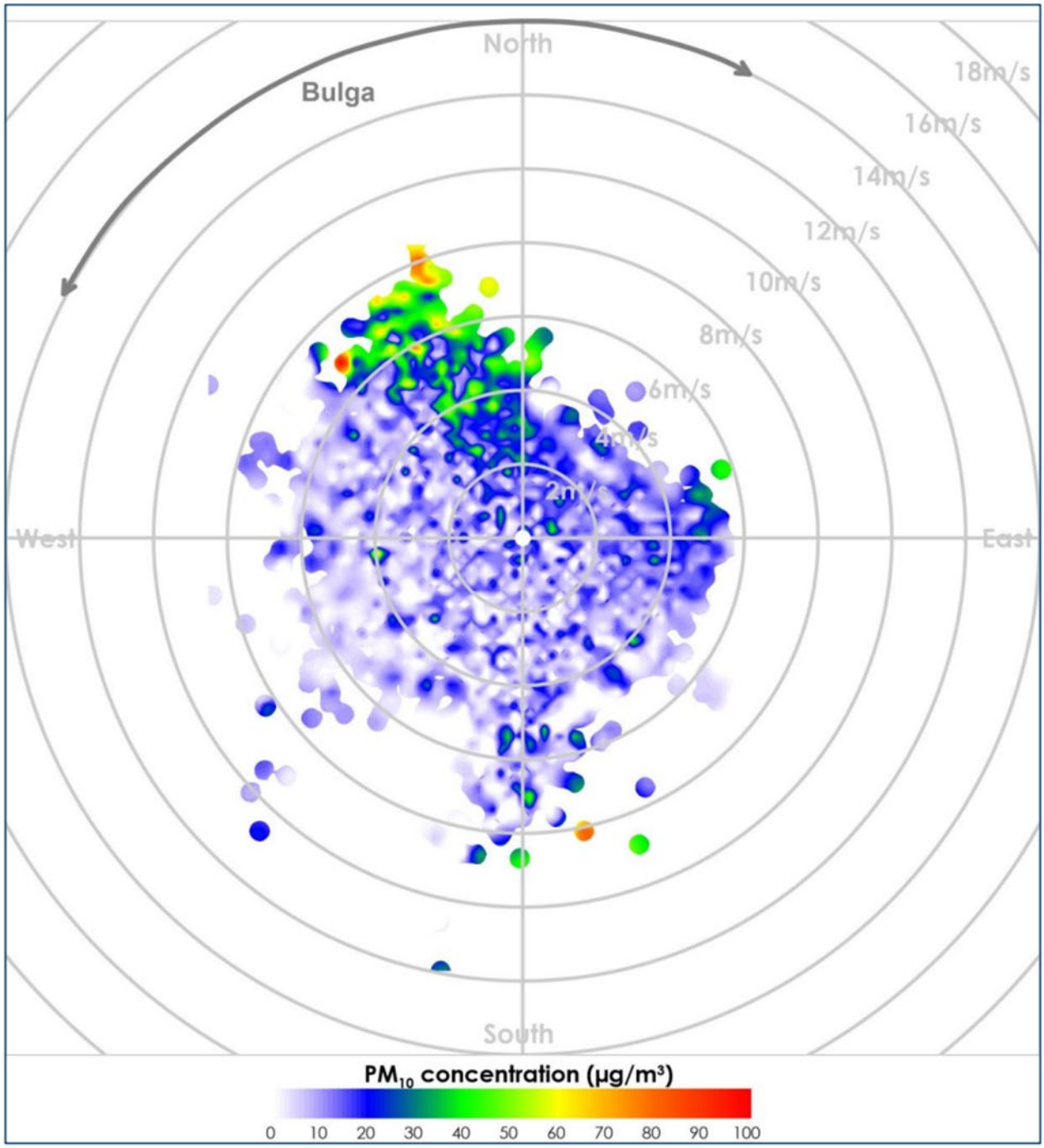


Figure 6.13 2023 Pollution-Rose[1] for EPA Point 10, PM_{10} Data (Todoroski Air Sciences, 2024)

[1] How to read a pollution rose:

- The colour indicates the pollutant concentration measured at the monitor.
- The position of pollutant concentration markings along the 360° axis indicates the corresponding direction from which pollutants arise from.
- The position of pollutant concentration markings relative to the banded rings indicates the wind speed for the corresponding hourly concentration.
- The arc labelled "Bulga" indicates the relative direction of Bulga Complex from the monitor.

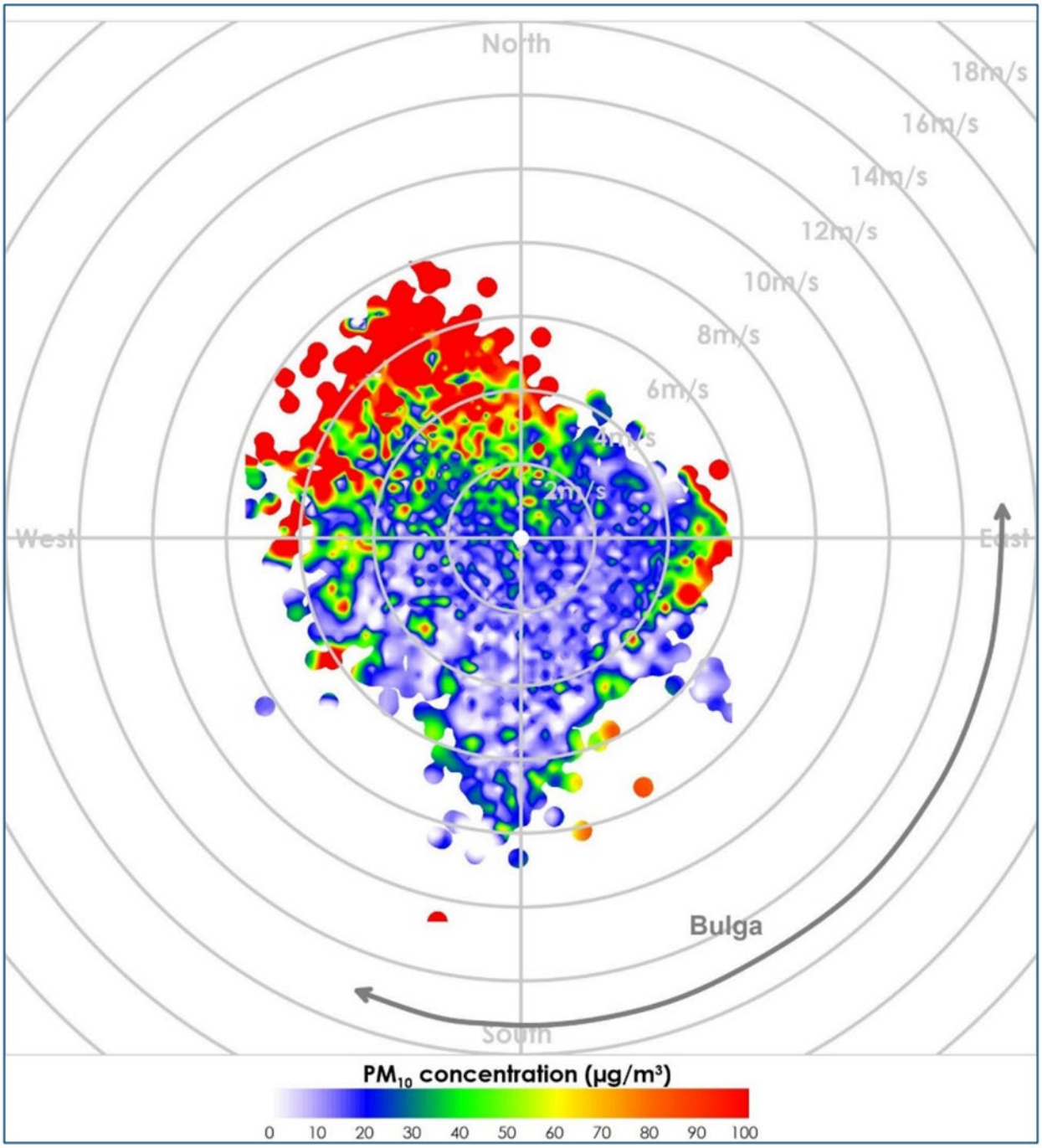


Figure 6.14 2023 Pollution Rose[2] for EPA Point 9, PM_{10} Data (Todoroski Air Sciences, 2024)

[2] How to read a pollution rose:

- The colour indicates the pollutant concentration measured at the monitor.
- The position of pollutant concentration markings along the 360° axis indicates the corresponding direction from which pollutants arise from.
- The position of pollutant concentration markings relative to the banded rings indicates the wind speed for the corresponding hourly concentration.
- The arc labelled "Bulga" indicates the relative direction of Bulga Complex from the monitor.

Mushroom Composting Facility

Figure 6.15 presents the PM_{10} 13-hour average measured at the Mushroom Composting Facility (D4 TEOM monitor) against the 13-hour average Assessment Level of 91 µg/m^3. The Assessment Level only applies during the approved operating hours of the Mushroom Composting Facility. These are between 6:00 am and 7:00 pm Monday to Friday, and any additional operating hours of the Mushroom Composting Facility, provided that:

- Such operating hours do not exceed 6:00 am to 12:00 pm on weekends.
- The Mushroom Composting Facility has given Bulga Coal at least one month advance notice of the intention to operate during those additional operating hours.

As shown in **Figure 6.15**, there were no occasions where levels were above the assessment level of 91 µg/m^3.

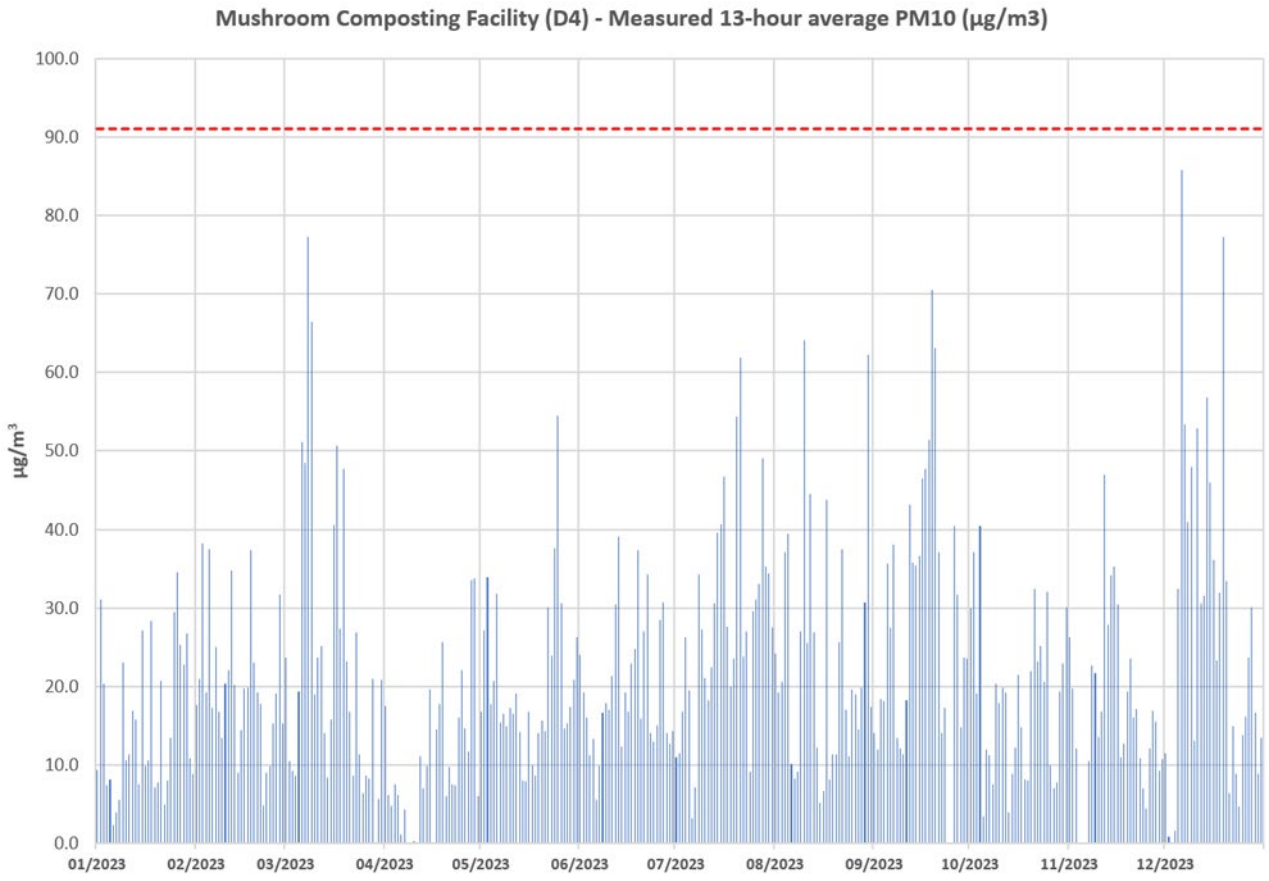


Figure 6.15 Mushroom Composting Facility (D4 Sampling Results 2023 – 13-hour PM_{10} Averages)

6.4.3 Comparison Against Predictions

A comparison of 2023 dust monitoring data with the modelled predictions made in the *Bulga Coal Complex Modification 3 Air Quality Impact Assessment* (Jacobs, 2019) (Year 2022) was undertaken by Todoroski Air Sciences (2024) (attached as **Appendix B**). The analysis shows that the annual average measured levels in 2023 were generally lower than the predictions for the representative modelling scenarios. In general, it is

considered that 2023 was a relatively hot and dry year for NSW which may have contributed to the slight increase in dust levels measured in 2023.

6.4.4 Long Term Analysis

An assessment of long-term trends over the life of Bulga Coal operations was undertaken by Todoroski Air Sciences (2024) (**Appendix B**). Annual average levels were generally consistent with pre-2022 levels, likely due to a dryer and hotter than usual rainfall. The trends in air quality reflect the prevailing meteorological conditions and not the mining activity.

6.4.5 Implemented/Proposed Improvements

No changes were made to the air quality monitoring network during 2023.

In December 2023 Bulga Coal added a Cat 777 Water Truck to the existing fleet.

6.5 Mine Subsidence

6.5.1 Environmental Management

The last underground coal was mined in May 2018 and the relevant Subsidence Management Plan expired in December 2019. Subsidence impact monitoring and mitigation works are now completed in accordance with the *Bulga Underground Operations Post Mining Subsidence Management Plan*.

6.5.1.1 Monitoring Results

Repairs to surface subsidence cracking identified during monitoring activities for previously mined areas continued to be undertaken during the reporting period. The observed impacts caused by subsidence are summarised in **Table 6.21**.

Table 6.21 Observed Subsidence Impacts

Feature	Impact Performance Measures	Observed Impacts
Surface Cracking	Always safe. Stable, non-polluting post mining landform.	No adverse impacts reported. Continue to monitor and repair as required
Telecommunications & powerlines	Always safe. Serviceability should be maintained wherever practicable.	No adverse impacts identified to public or internal infrastructure
Pipelines and tanks	Always safe. Serviceability should be maintained wherever practicable.	No adverse impacts identified to public or internal infrastructure.
Roads and gates	Always safe. Serviceability should be maintained wherever practicable.	No adverse impacts identified to public or internal infrastructure.
Fences	Always safe. Serviceability should be maintained wherever practicable.	No adverse impacts identified to public or internal infrastructure.

Feature	Impact Performance Measures	Observed Impacts
Buildings	Always safe. Serviceability should be maintained wherever practicable.	No adverse impacts identified to public or internal infrastructure.
Archaeology sites and vegetation	Stable, non-polluting post mining Landform.	No adverse impacts reported.

6.5.2 Comparison Against Predictions

A comparison against predictions was not applicable considering underground mining did not occur during 2023.

6.5.3 Implemented/Proposed Improvements

As noted above, Bulga Underground Operations have continued to progressively complete repairs to surface subsidence cracking identified from monitoring. Monitoring of previously mined areas will continue in 2023. Any required mitigation works will be completed in accordance with the *Bulga Underground Operations Subsidence Mapping and Repair Procedure* and the *Bulga Underground Operations Post Mining Subsidence Management Plan.*

6.6 Biodiversity and Offsets

Bulga Coal implements management activities and conducts annual ecological monitoring in remnant vegetation areas located within the mine site, Biodiversity Offset Areas (BOAs) and mine rehabilitation areas. The activities and monitoring programs implemented during 2023 can be found in the following sections:

- Remnant vegetation around the mine site (**Section 6.6.1**).
- Offset areas (**Section 6.6.2**).
- Mine rehabilitation (**Section 8.6**).

During 2023, the biodiversity and offset monitoring programs were completed successfully. In general monitoring results showed a constant to slightly increasing trend in both flora and fauna, and species diversity and abundance.

6.6.1 Remnant Vegetation

6.6.1.1 Environmental Management

Flora and fauna monitoring is conducted around the mining operations in accordance with the *Biodiversity Management Plan* (BMP). The locations of ecological monitoring sites are shown in **Figure 6.16**. The ecological monitoring of mine rehabilitation is outlined in **Section 8.6**.

6.6.1.2 Annual Ecological Monitoring Program – Flora

The annual ecological monitoring program for remnant vegetation was undertaken in 2023 with a summary of the results presented in **Section 6.6.1.4**.

The long-term remnant vegetation monitoring program utilises the Biodiversity Assessment Methodology (BAM) to compare rehabilitation areas with biometric scores from the targeted vegetation communities.

The primary objective of the monitoring program is to assess the health and condition of remnant vegetation at Bulga Coal. The BAM was adopted during 2018 to be consistent with the Biodiversity Conservation Division (BCD) (formerly the Office of Environment and Heritage (OEH)) requirements and to match the methodology used at rehabilitation sites. The BAM involves assessing vegetation condition based on the compositional, structural and functional attributes of a site (OEH 2018).

Bulga Coal

FIGURE 6.16 - Bulga Coal Ecological and Rehabilitation Monitoring 2023

Ref: Q:\03_MapDocuments\18_Reporting\Annual_Review\2023\AR FIGURES\20240201_Figure_6_16_AR_Eco_Rehab_Monitoring_A4_GDA2020.mxd

Legend

- Current_Authorisations
- Mining Lease AMA
- Offset Area Boundaries
- Main Roads
- Local Roads
- Watercourse

Rehabilitation Phase

- Ecosystem and Land Use Establishment
- Ecosystem and Land Use Development

- Fauna Monitoring
- Nest Box Monitoring
- Remnant Vegetation Monitoring
- Rehabilitation Monitoring
- Reference Monitoring

GDA2020

Date Created: 18/03/2024
Map Size: A4 Portrait
Scale: 1:62,500
Map Created By: rabbott
Coordinate System: GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

6.6.1.3 Annual Ecological Monitoring Program – Fauna

Ecological monitoring for fauna was completed by Forest Fauna Surveys (2023) and results provided in the 2023 Annual Fauna Monitoring Report which is available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/monitoring-documents). A summary of results is provided in **Section 6.6.1.4**. The methodology includes targeted surveys of birds, bats, reptiles and amphibians, owl call-playback, fauna spotlighting and opportunistic fauna surveying.

The program is designed to check if there have been any impacts on the surrounding terrestrial and aquatic habitats (outside of approved disturbance areas) because of mining operations and to monitor the habitat condition of rehabilitation areas.

6.6.1.4 Environmental Performance

6.6.1.5 Flora Monitoring

In accordance with the *Bulga Complex Biodiversity Management Plan*, ecological and photographic monitoring of remnant flora was conducted at four monitoring sites in 2023 located within the following vegetation communities:

- PCT 1603 - Central Hunter Grey Box – Ironbark Woodland Endangered Ecological Community (EEC)(two sites).
- PCT 1604 - Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC.
- PCT 1731 - Swamp Oak Forest.

Overall, the 2023 monitoring results highlighted the ongoing good vegetation condition at the grassy woodland/forest reference/ecological monitoring sites. At the riparian Swamp Oak Forest site, weed incursion remained the main issue impacting vegetation quality, with Lantana and exotic grasses being highly problematic and requiring management if vegetation condition and integrity scores are to be improved.

6.6.1.6 Fauna Monitoring

Fauna monitoring was undertaken at nine sites in areas of remnant vegetation and rehabilitation across the project area:

- Remnant Woodland and Riparian Vegetation Sites – BM04, BM10, BM18 and BM23.
- Mine Rehabilitation Sites – BM07a, BM18a, BM19a, BM27a and BM28.

Diurnal census surveys for birds recorded 69 species, an increase on 58 species recorded in 2022. No new bird species were added to the cumulative total in 2023, however, the Australian Brush Turkey was again recorded on camera at site BM23. This species was previously detected for the first time at Bulga Coal monitoring surveys in 2022. Three threatened bird species were recorded in rehabilitation areas, including the Little Lorikeet, Speckled Warbler and Grey-crowned Babbler. The Varied Sitella was located in remnant woodland site (BM10), with no evidence of the species in newly established rehabilitation areas. The Speckled Warbler and Grey-crowned Babbler were also observed at multiple remnant woodland sites, both species are considered widespread within Bulga Coal.

The Little Lorikeet were observed to roost at dusk in mature trees near site BM27a, and a small flock was observed and heard flying overhead at one rehabilitation site BM27a in December 2023

Infra-red motion detection digital cameras were installed at selected monitoring sites (BM04, BM07a and BM23) to photograph fauna. Bait stations were set up in the field of view of each camera with photographs obtained from 22 August to 6 December 2023. The cameras were removed, and photographs analysed for species identification. A total of 9,656 images were recorded for analysis, however, many of the images were false positives (e.g. movement of vegetation by strong wind triggered an image with no fauna present). A total of seven native and five introduced mammal species were detected, including the short-beaked echidna, bare-nosed wombat, northern brown bandicoot and the eastern grey kangaroo.

Thirteen bat species were recorded in the Bulga Coal area in 2023 by spotlight search and echolocation call recordings. A total of 231 calls were recorded across nine sites and two sampling periods. This compares to 7 species and 171 calls recorded in 2022. The 231 echolocation calls were analysed to determine 12 microchiropteran bat species at Bulga Coal in 2023. Two sites recorded no microbat activity by echolocation call recording, despite sampling being conducted over 2 non-consecutive nights in October and December 2023. Factors responsible for the low microbat activity are unknown, but the lack of suitable flyways at sites BM19a and BM23, may explain the absence of foraging microbats. Spotlight searches in 2023 detected the Grey-headed Flying fox within the Bulga Coal area. Foraging resources (nectar pollen) was considered low in abundance for this bat group, which would influence their low abundance from the area in 2023.

Reptile microhabitat is variable at the rehabilitation and revegetation sites. Terrestrial microhabitat for reptiles in rehabilitation areas contains both dense regrowth of trees, plus open areas separating each stand. This provides ideal habitat for reptiles as the open areas provide basking habitat, and dense shade provides cooler habitat, particularly on heatwave days with high diurnal temperatures. Ground microhabitat includes placement of small to larger boulders from overburden areas, which provide ideal sheltering and basking sites for several reptile species. At two new monitoring sites BM07a and BM27a (located off Charlton Road), large rock drains have been constructed for stormwater management. These large rock drains provide high quality habitat for reptiles and other fauna species, including basking and sheltering sites. A number of smaller skink species were observed basking in sunlight in these drains during the field surveys.

Four threatened bird species and four threatened mammal species were detected in rehabilitation areas in 2023. The Little Lorikeet, Grey-crowned Babbler, Speckled Warbler, Varied Sitella *Daphoenositta chrysoptera* have all been previously recorded in the rehabilitation monitoring areas. The threatened mammal species comprised of one megachiropteran bat (the Grey-headed Flying-fox) and three threatened microbats (the Eastern Freetail Bat, Little Bentwing-bat and Eastern Bentwing-bat). No evidence of the threatened Spotted-tail Quoll was recorded in 2023, being recorded for the first time at Bulga Coal in 2022.

During surveys in 2023, overall abundance of pest species is variable, with high numbers of pigs at several sites. The abundance of pigs is associated with above average rainfall over the past 3 years, resulting in large increase in numbers, and expansion of woodland habitat due to rehabilitation works. Ongoing control of pigs is regularly undertaken in Bulga Coal landholdings by trapping and poisoning, refer to **Section 6.6.2** and **Section 6.7** for a summary of pig control undertaken across Bulga Coal landholdings.

Feral cats were detected at two sites in 2023. The species is likely to be widespread and in relatively low abundance, due to the limited number of images recorded by monitoring over an extended period (105

continuous nights in 2023). Management of feral cats may require conducting periodic trapping surveys to reduce the abundance of this predator from the offset and rehabilitation areas.

Nest box monitoring was also undertaken in areas of remnant vegetation, refer to **Section 6.6.2**.

6.6.1.7 Implemented/Proposed Improvements

Recommendations from monitoring reports, where appropriate, will be implemented in 2024. These recommendations focus on land management practices to improve the health of vegetation and quality of habitat in surrounding vegetation.

Land management activities to be implemented in 2024 across remnant vegetation areas include: ongoing weed management (particularly focussing on Lantana (*Lantana montevidensis*)). Pest animal management will include dog baiting and opportunistic kangaroo culling, feral cat trapping and pig trapping in response to sightings or evidence of presence.

Field camera monitoring was employed over an extended time frame (3-4 months) in 2023, rather than previous monitoring surveys (2-4 days). Continued extended monitoring by field cameras is recommended, this methodology greatly increases the detection of cryptic and rare species, particularly those listed as threatened under State and Commonwealth legislation.

As Bulga Coal continues to clear remnant vegetation to allow for the progression of mining activities, habitat resources (logs, rocks, and tree hollows) will be salvaged for re-use in rehabilitation and where feasible, remnant vegetation areas.

Due to mining progression some remnant vegetation monitoring sites will be disturbed, or will become part of the Vere Biodiversity Offset Area under a Biodiversity Stewardship Agreement. During the next revision, Bulga Coal will update the *Biodiversity Management Plan* to reflect changes to the ecological monitoring program.

6.6.2 Biodiversity Offsets

Schedule 3, Condition 29 of SSD-4960 requires Bulga Coal to establish and maintain five Biodiversity Offset Areas (BOAs). Condition 9 of EPBC 2012/6637 and Condition 12 of EPBC 2018/8300 requires an annual report including implementation of the associated management plans (see **Section 6.6.2.1** to **Section 6.6.2.4**) and detailing compliance with the conditions of the approval (see **Appendix A**). The BOAs were established in agreement with the BCD and its performance is currently overseen by the Biodiversity Conservation Trust (BCT). Bulga Coal currently manages the BOAs presented in **Table 6.22**.

Table 6.22 Bulga Coal Biodiversity Offset Areas

Biodiversity Offset Area	Area (ha)	Conservation Agreement Date
Broke Road BOA	251	9 May 2019
Condran	50	7 May 2019
Reedy Valley	1,486	7 May 2019
Wollombi Brook Conservation Area (WBCA)	65 (BOA) 51 (Aboriginal heritage conservation)	7 May 2019
Vere Biodiversity Stewardship Agreement (BSA)	154	4 December 2023

The Broke Road BOA, and WBCA are located in the north-eastern and north-western corners of Bulga Coal, respectively. The Reedy Valley and Condran BOAs are located further from Bulga Coal and are approximately 30 km north-west and 10 km south-east of Muswellbrook, respectively. In addition, Bulga Coal committed to establishing two Weeping Myall Management Areas in the Bulga Optimisation Project EIS. These were established in 2015. Figure 6.17 shows the general location of the Biodiversity Offsets and Management Areas.

In accordance with Schedule 3, Condition 33A of SSD-4960 Bulga Coal has committed to establishing and managing the Vere BSA Area (154 ha) located to the south-east of Bulga Coal (Figure 6.17) within two years of the commencement of development approved under SSD-4960 Mod 3. Development approved under Mod 3 commenced in September 2020. An extension of time for establishment the Vere Biodiversity Stewardship agreement was granted by the DPHI on 21 November 2022 to the 30 June 2023. Two additional extensions of time to secure the Vere BSA Area were approved by DPHI, to the 31 December 2023 and then to 29 February 2024. The Credits Supply Taskforce finalised and registered the Biodiversity Stewardship Agreement on 20 December 2024.

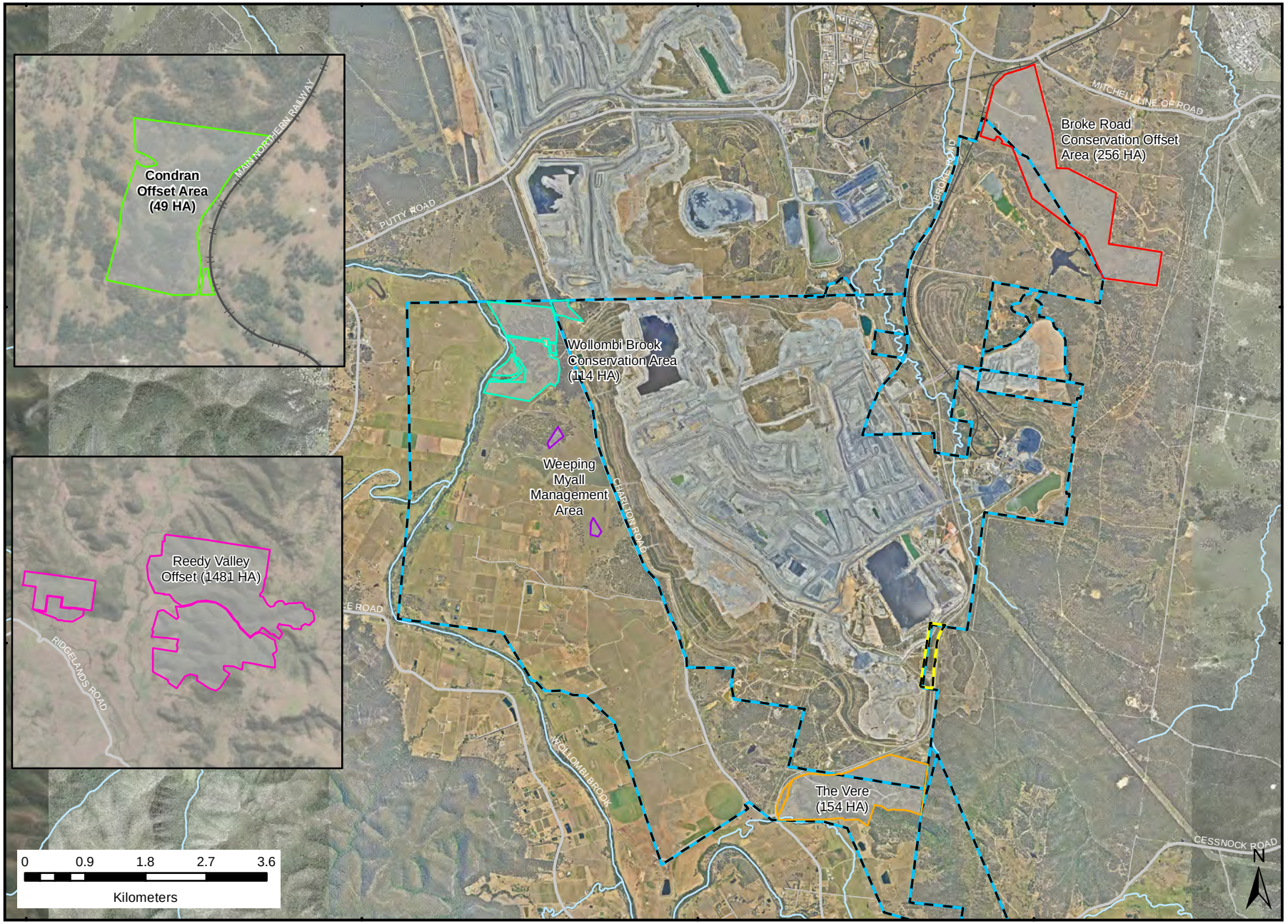
At each BOA, monitoring is undertaken to assess performance against defined indicators as specified by the conservation agreements. Monitoring transects are 50 m in length, with each comprising ten quadrats 5 m x 5 m in size, positioned along alternate sides of the centreline. Within each quadrat, data on species diversity, age and structure of the canopy, and shrub strata are collected. For comparative purposes, replicated transects within adjacent regenerating grassland areas were also established to monitor the return of woodland to these areas. In effect, pairs of 50 m transects (i.e. 100 m transects of 20 quadrats) were positioned end-to-end across grassland-woodland boundaries so that restoration progress can be tracked over successive monitoring seasons. With the change to biometric monitoring in 2017, additional data on vegetation condition and habitat is also collected within a 20 m x 20 m quadrat positioned within these transects. In addition, fauna and habitat usage monitoring is conducted annually and every three years, respectively.

Progress against 2023 performance indicators for Broke Road, Condran, Reed Valley and Wollombi Brook BOA's, as detailed in Biodiversity Offset Management Plan (BOMP) is shown in **Appendix C**.

Bulga Coal

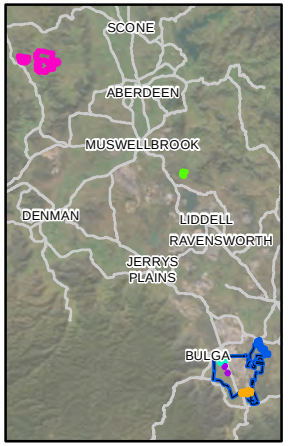
FIGURE 6.17 - Bulga Coal Biodiversity Offsets and Management Areas

GLENCORE



Legend

- Current_Authorisations
- Mining Lease AMA
- Broke Road Conservation Offset Area
- Condran Offset Area
- Reedy Valley Offset Area
- The Vere Offset Area
- Weeping Myall Management Area
- Wollombi Brook Conservation Area
- Main Roads
- Local Roads
- Watercourse
- Railway



GDA2020

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Map Created By: rabbott
Coordinate System:
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Projection: Transverse Mercator
Datum: GDA2020

File Path Ref: Q:\03_MapDocuments\18_Reporting\Annual_Review\2023\AR FIGURES\20240201_Figure_6_17_AR_Offsets_A4_GDA2020.mxd

6.6.2.1 Broke Road BOA

Environmental Management

Environmental management activities undertaken at the Broke Road BOA in 2023 included:

- Weed control works focussing in particular on Lantana (*Lantana montevidensis*), St John's Wort (*Hypericum perforatum*), Cotton Bush (*Gomphocarpus fruticosus*), Fireweed (*Senecio madagascariensis*), Verbena (*Verbena bonariensis*), Juncus (*Juncus acutus*) and Oleander (*Nerium oleander*).
- Bushfire firebreak slashing along tracks and fence lines and about 28 ha slashed on neighbouring properties, along the north-western boundary, to reduce bushfire risk.
- Wild dog and fox baiting program during autumn and spring months resulted in 5 wild dogs, 6 foxes, 5 feral cats.
- A detailed weed survey was completed in 2023 to develop the Broke Road Operational Weed Management Action Plan 2024-2028.
- Control actions undertaken by a qualified contractor.
- 27 feral pig takes.
- Four feral pigs controlled.
- Preparation works for of 54.2 ha to complete the planting of Central Hunter Grey Box Ironbark Woodland EEC in 2024.
- Six-monthly inspections.
- Ongoing ecological monitoring program.
- Regeneration assessment.

Monitoring Results

The annual monitoring program is generally completed during spring and autumn in the Broke Road BOA. The 2023 monitoring program included fauna, flora and nest boxes. Flora monitoring showed a decreasing trend in native and weed species diversity across the various plots in 2023. In general, previous increases in plant species and structure diversity still provide a wider range of habitat for native fauna including threatened species. Additionally, the habitat augmentation program had showed an increased use of nest boxes during the monitoring period.

<u>Flora</u>

Below are key findings during the 2023 flora monitoring at Broke Road BOA:

- 68 native and 47 weed (115) species were detected in 2023.
- The three revegetation plots supported between 29 (18 natives, 11 weeds) species in plot BRO08R and 39 (23 native, 16 weeds) species in plot BRO07R.

- Forest and grassland transects of Native Ground Cover (Grass) (NGCG) largely meet or approach benchmark values for the single Plant Community Types (PCTs) present at Broke Road Voluntary Conservation Agreement (VCA): PCT 1605 (*Narrow-leaved Ironbark – Native Olive shrubby open forest of the central and upper Hunter*).
- No new records of threatened plant species were recorded.
- The existing individual clump of *Cymbidium canaliculatum* (endangered population in the Hunter Catchment) persists adjacent to transect BRO04F and was flowering during field surveys.
- Monitoring plots established within the vulnerable *Eucalyptus glaucina* population showed continuing evidence of new recruitment following a wet three years, a feature repeated throughout the whole population.

Fauna

Below are key findings during the 2023 fauna monitoring at Broke Road BOA:

- Four threatened fauna species were recorded (1 bird and 3 microbat species) in 2023;.The total bird species diversity, based on surveys for the 2023 monitoring year and previous monitoring years, is 129 native and two introduced bird species.
- The diurnal bird census recorded 59 native bird species across 9 monitoring sites in 2023. Comparisons to previous monitoring years reveal an increase in diversity at several rehabilitation / revegetation sites.
- One threatened bird species was recorded, the Grey-crowned Babbler.
- One new bird species was recorded for Broke Road BOAin 2023, the Cicadabird. This is a common woodland bird in the Hunter Region.
- Site BR007R recorded the highest bird species diversity overall in 2023, with BR008R comparable to the remnant woodland sites.
- Two of the revegetation sites also recorded the highest bird species diversity across all sites in previous monitoring years.
- Twelve microchiropteran bat species were recorded by echolocation calls in 2023. A total of 430 calls were identified, which is an increase on the number of calls from the previous monitoring period.
- Three threatened microbat species were detected: the Eastern Freetailed-bat, Eastern Bentwing-bat and Little Bentwing-bat.

A detailed list and location of fauna species recorded can be found in the Biodiversity Offset Monitoring Report which is available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/monitoring-documents).

Performance Against Criteria

During 2023, 15 of the 17 performance indicators were met and two were below the specific criteria (**Appendix C**).

Implemented/Proposed Improvements

Weed Management

The 2024 weed management strategy for Broke Road BOA will focus on the management of highest and high priority species identified in the *Broke Road Operational Weed Management Action Plan 2024 – 2028*.

Pest Management

Surveys and control activities undertaken in 2023 indicate that the change in weather conditions had slightly reduced the feral pig numbers during 2023. Wild dog and fox take decreased during the 2023 baiting programs.

Pest fauna present are contiguous with the wider landscape, and effective management for control requires a coordinated approach with neighbouring landholders (particularly the neighbouring Department of Defence) to ensure the wider source populations are controlled to reasonable levels. The monitoring to date indicates pest species do not require any additional control efforts over those already prescribed in the BOMP and current management practices.

In 2024 pest control activities will continue to be implemented with additional opportunistic management also undertaken in response to sightings or evidence of pest species presence. Planned pest management activities include wild dog and fox baiting in collaboration with Local Land Services to maximise the effectiveness of the program.

Habitat Augmentation and Revegetation

Habitat augmentation features are prioritised for the following threatened fauna species, the Regent Honeyeater, Swift Parrot and Large-eared Pied Bat. The Large-eared Pied Bat is a cave roosting microbat that would forage on the Broke Road BOA site as part of its larger foraging range. No roosting habitat features occurred or could be constructed on the Broke Road site for the species.

Habitat augmentation measures were observed throughout the BOA in 2023 as result of the complete removal of internal barbed wire fencing.

In 2024 revegetation works will continue at the Broke Road BOA with planting of 54.2 ha (54,400 stems) of Central Hunter Grey Box Ironbark Woodland EEC.

General Management

Slashing, removal of redundant internal fences, and annual weed management will be undertaken where feasible to minimise both bushfire risk and further spread of priority weeds.

Fence repairs and track maintenance will be undertaken on an as needs basis, as identified through inspection programs.

6.6.2.2 Condran BOA

Environmental Management

Activities undertaken at the Condran BOA in 2023 included:

- Bushfire firebreak slashing along tracks and fence lines.

- Track maintenance across the offset area.
- A detailed weed survey to develop the Condran Operational Weed Management Action Plan 2024 – 2028.
- Weed controls works, focusing on Crofton weed (*Ageratina Adenophora*), Coolatai grass (*Hyparrhenia hirta*), Rhodes grass (*Chloris gayana*), Whisky grass (*Andropogon virginicus*), Pampas grass (*Cortaderia species*) and Sweet briar (*Rosa rubiginosa*).
- Wild dog and fox baiting program during autumn and spring months resulted in 12 fox takes.
- Six monthly inspections.
- Continuation of the ecological monitoring program established in 2013.

Monitoring Results

The annual monitoring program is generally completed during spring and autumn in the Condran BOA. The 2023 monitoring program included fauna and flora. During the 2023 flora monitoring period, 60 native and 29 weed species were detected; showing a decreasing trend in species diversity of native species and weeds compared to 2022. The fauna monitoring conducted in 2023 recorded an abundance in bird species diversity. Two threatened bird species and the presence of the threatened Spotted-tail Quoll was recorded during the 2023 program.

Flora

Below are key findings during the 2023 flora monitoring at Condran BOA:

- Relative to 2022 data, there was a continued decreasing trend in diversity of native species and weeds in 2023. No threatened plant species were recorded within monitoring transects.
- The existing population of Diuris tricolor (vulnerable, and an endangered population in the Muswellbrook LGA) persists within the BOA despite very low emergence and the lack of seed dispersal in the 2023 season.
- Comparative data with the common Diuris sulphurea also showed no seed release in 2023, suggesting that environmental factors including dry conditions and grazing pressure govern emergence, flowering and seed release in both species.
- Biometric data from the eight monitoring plots have been compared against benchmark values for the relevant PCTs present at Condran BOA. The findings are detailed below:
    - For PCT 1605, only Native Ground Cover (Other) for Ironbark approaches benchmark values. Grassland data for PCT 1605 show a similar pattern with most attributes well below benchmark.
    - For PCT 1607, all attributes lie below benchmark for the Redgum MU (CON01F).
- Dry weather conditions during 2023 will be the major reason transects and attributes are below benchmark.

Fauna

Below are key findings during the 2023 fauna monitoring at Condran BOA:

- Two threatened bird species were recorded in 2023, the Grey-crowned Babbler and Speckled Warbler.
- No evidence of the nationally endangered Swift Parrot or Regent Honeyeater were recorded in 2023.
- Overall diversity of native mammals was low across all mammal groups, although the use of remote field cameras to survey larger mammals is very short in duration.
- The threatened Spotted-tail Quoll was detected by field camera monitoring. This is the first time the species has been recorded, despite it being recorded at adjoining biodiversity offsets in previous monitoring years.
- Two microbat species were recorded in 2023, which is a decline in diversity and abundance over the previous monitoring year (2022). Over the period 2019 to 2023, very low abundance and diversity of microbats has been recorded due to factors unknown.
- Reptile diversity was lower in 2023 than previous monitoring years, with only one species detected. Frog activity was also suppressed, with limited calling activity along the un-named creek line on the eastern side of the BOA.
- One key preliminary performance indicator for the Condran BOA is that there is no significant pest animal (or weed) infestation within the offset that adversely affects the quality of existing or regenerating vegetation.
- Evidence from the observed extent of dung suggests cattle were again present in 2023.

A detailed list and location of fauna species recorded can be found in the Biodiversity Offset Monitoring Report which is available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/monitoring-documents).

Nest Boxes

16 nest boxes were installed in the Condran BOA in October 2022. The monitoring program commenced in 2023 and will be conducted every three years. This monitoring program meets the Habitat Augmentation requirements outlined in the Condran BOMP.

13 (76%) of the 16 nest boxes inspected showed evidence of usage, with 3 (18%) nest boxes occupied during field surveys. **Table 6.23** shows the usage rate, species diversity and abundance of species that have used, or had signs of evidence, in each nest box design.

Table 6.23 Bulga Coal Nest Boxes usage at Condran Conservation Area in 2023

Nest Box Design	Total Number of Boxes	Evidence of Usage	Diversity and Abundance (Species Using the Box)
Parrot	4	4 (100%)	Glider x 4
Possum	4	3 (75%)	Brushtail Possum x 3
Rear-entry Glider	4	4 (100%)	Glider x 4
Microbat	4	1 (25%)	Antechinus x 1

Nest Box Design	Total Number of Boxes	Evidence of Usage	Diversity and Abundance (Species Using the Box)
Total	**16**	**12 (75%)**	**3 species**

Performance Against Criteria

During 2023, 15 of the 16 performance indicators were met and one was below the specific criteria (**Appendix C**).

Implemented/Proposed Improvements

Weed Management

The 2024 weed management strategy for Condran BOA will focus on the management of highest and high priority species identified in the *Condran Operational Weed Management Action Plan 2024 – 2028*.

Pest Management

Based on long-term monitoring of the Condran BOA by field cameras, the presence of introduced pest animals is considered low. Pest species that do occur at the Condran BOA are part of the wider surrounding landscape and will require a co-operative approach with input from several stakeholders to manage effectively. It is not considered that the pest species present are adversely affecting the quality of the existing or regenerating vegetation, or native fauna populations at the Condran BOA.

During 2024 Bulga will aim to align timing of wild dog and fox baiting programs at Condran with the Local Land Services aerial baiting program for neighbouring landholders to maximise the effectiveness of the program. Other pest species will be controlled on an as needed basis, based on inspection and monitoring outcomes.

6.6.2.3 Reedy Valley BOA

Environmental Management

The activities undertaken at the Reedy Valley BOA in 2023 included:

- Maintenance to internal tracks deteriorated during 2022 and creek crossings repairs to ensure safe access to the BOA.
- Bushfire firebreak slashing along tracks and fence lines.
- Detailed weed survey to develop the Reedy Valley Operational Weed Management Action Plan 2024 – 2028.
- Weed control works focussing on Prickly pear (*Opuntia* species), Moth vine (*Araujia sericifera*), Bathurst burr (*Xanthium spinosum*), Sweet briar (*Rosa rubiginosa*) and St John's Wort (*Hypericum perforatum*).
- Feral animal control in conjunction with the wider program being completed by Local Land Services and surrounding property owners. In 2023 Bulga Coal participated in the wild dog aerial baiting program in May 2023, the aerial shoot for pest animals in November 2023 and wild dog trapping in December 2023.

- The wild dog and fox baiting program during autumn and spring resulted in 41 wild dogs, 52 fox and seven feral pig takes.
- 82 feral pigs controlled.
- Revegetation planting of 14 ha (14,000 stems) of Central Hunter Grey Box Ironbark Woodland EEC, and 7 Ha (7,000 stems) of White Box – Yellow Box – Blakely's Red Gum Woodland critically endangered ecological community (CEEC).
- Six-monthly inspection was completed in 2023.
- Ongoing ecological monitoring program.
- Regeneration assessment.

Monitoring Results

The annual monitoring program is generally completed during winter and spring in the Reedy Valley BOA. The 2023 ecological monitoring program included fauna, flora and revegetation assessment. During the 2023 flora monitoring period, 79 native and 40 weed species were detected. The fauna monitoring conducted in 2023 recorded stable bird species diversity compared to previous years. Six threatened fauna species (4 birds, 2 microbats) were recorded at Reedy Valley BOA in 2023, with an additional 17 species recorded from previous monitoring surveys.

Flora

Below are key findings during the 2023 flora monitoring at the Reedy Valley BOA:

- There was a decreasing trend in diversity of native species and weeds in 2023, following on from the dry conditions.
- No threatened plant species were recorded within monitoring transects.
- Biometric data from all monitoring plots have been compared against benchmark values for the two PCTs present: PCT 483 (*Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley*) and PCT 623 (*Narrow-leaved Ironbark +/- Grey Box grassy woodland of the upper Hunter Valley, mainly Sydney Basin Bioregion*). The findings include:
    - For forest transects in PCT 483, benchmark values were attained in some transects for Native Over-storey Cover, Native Mid-storey Cover (shrubs), Native Ground Cover (other) and Fallen Logs. All other attributes remain below benchmark.
    - For grassland transects in PCT 483, only Native Ground Cover (other) exceeds benchmark for some transects.
    - For forest transects in PCT 623, benchmark values were approached or exceeded in some transects for Native Over-storey Cover, Native Mid-storey Cover, Native Ground Cover (other) and Fallen Logs.
    - For grassland transects in PCT 623, only Native Ground Cover (other) exceeded benchmark for two transects, all others short. Number of Trees with Hollows and Fallen Logs for both PCTs are well below benchmark.

Fauna

Below are key findings during the 2023 fauna monitoring at the Reedy Valley BOA:

- The diurnal bird census recorded 73 native bird species across the twelve monitoring sites in 2023, which is comparable to previous monitoring years.
- Four threatened bird species were recorded in 2023: the Brown Treecreeper, Speckled Warbler, Grey-crowned Babbler and Varied Sitella.
- Total bird species diversity, based on surveys from all monitoring years, is 137 bird species. No new bird species were detected in the BOA in 2023.
- No evidence of the critically endangered Regent Honeyeater or Swift Parrot were recorded in 2023. The last sighting of a Regent Honeyeater at Reedy Valley VCA was in 2009 during the EIS surveys.
- The comparison of bird species diversity is divided between two broad habitat types: Derived Native Grassland (DNG) and Remnant Forest / Woodland. The DNG recorded lower overall diversity and abundance of bird species compared to Remnant Woodland in 2023.
- Spotlight searches in 2023 recorded only the Common Brushtail Possum.
- Ten microbat species were detected by echolocation call recordings in 2023, two of which are listed as threatened, the Eastern Bentwing-bat and Large-eared Pied Bat. Microbat activity was low at several sites, with one monitoring site RV09 recording no bat calls over 2 non-consecutive nights.
- The Grey-headed Flying-fox was not observed feeding in Reedy Valley BOA during 2023, possibly due to limited abundance of nectar and pollen in flowering eucalypt trees.

A detailed list and location of fauna species recorded can be found in the Biodiversity Offset Monitoring Report which is available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/monitoring-documents).

Revegetation and Regeneration Assessment

An assessment of completed revegetation works and natural regeneration across the Reedy Valley BOA was undertaken in April 2023, with the following findings:

- 2019 planting zones (~10.0 ha) have been completely unsuccessful with no evidence of shrub/tree establishment observed, replanting will be required.
- Of the six zones planted in 2021 (~26.4 ha), only one located in the south-west of the BOA (~8.1 ha) displayed successful outcomes (i.e. satisfactory tubestock survival and growth). Another zone was partially successful with approximately 30% of its area (~1.3 ha) showing adequate seedling establishment. All other zones / areas (~ 17.0 ha) appeared mostly unsuccessful and will likely need to be re-planted.
- The small 2022 White Box – Yellow Box – Blakely's Red Gum Woodland planting zone (~1.9 ha) appears unsuccessful, with created furrows / rip lines observed but tubestock seedlings absent.

- The 2022 Central Hunter Grey Box Ironbark Woodland planting zone (~9.5 ha) appeared partially successful with only scattered live seedlings observed in some areas within the zone. However, seedlings remained small at the time of inspection and could have been difficult to sight in areas of denser ground vegetation. Revegetation outcomes will be re-assessed in 1-2 years.

Key findings from the Reedy Valley BOA assessment are summarised in **Table 6.24**.

Table 6.24 Bulga Coal Regeneration Assessment Summary at Reedy Valley BOA

Type	Cumulative Area (ha)	Recommended Action
Planted areas – Successful	9.4	No action required
Planted areas – Partially successful (trending)	9.5	Monitor and re-assess in 1-2 years. Improve with infill tubestock plantings if necessary
Planted areas – Unsuccessful	28.9	Rework / revegetate
Natural regeneration – Active (moderate to high)	21.4	Unlikely to require active revegetation or improvements
Natural regeneration – Limited to absent	97.7	Broadscale active revegetation / plantings

Performance against Criteria

During 2023, 11 of the 16 performance indicators were met and 5 were below the specific criteria (**Appendix C**).

Implemented/Proposed Improvements

Weed Management

The 2024 weed management strategy for Reedy Valley BOA will focus on the management of highest and high priority species identified in the *Reedy Valley Operational Weed Management Action Plan 2024 – 2028*.

Pest Management

Bulga Coal will aim to align timing of wild dog and fox baiting programs at Reedy Valley BOA with the Local Land Services aerial baiting program in 2024 to maximise the effectiveness of the program. Ongoing inspections and monitoring will determine if cattle and other pest species persist, including feral pigs, deer, foxes and goats which have been sighted at elevated and riparian parts of the BOA.

Management of some pests, particularly in the rocky outcrop parts of the site will be difficult due to the terrain and abundance of source populations in adjoining properties.

Habitat Augmentation and Revegetation

In 2024 revegetation works will continue at the Reedy Valley BOA with planting of 16.4 Ha (16,400 stems) of White Box – Yellow Box – Blakely's Red Gum Woodland EEC.

General Management

Slashing of boundary fencing, tracks and priority weed infestations will be undertaken where feasible to minimise both bushfire risk and further spread of weeds. Additionally, fence repairs will be undertaken on an as needs basis, as identified through inspections.

6.6.2.4 Wollombi Brook Conservation Area

Environmental Management

The activities undertaken at the WBCA in 2023 included:

- 9 ha burnt during the cultural cool burn conducted in August 2023 in collaboration with NSW Local Land Services and The Fire Sticks Alliance as a training exercise on Bulga Coal's Wollombi Brook Conservation Area.
- Detailed weed survey to develop the WBCA Operational Weed Management Action Plan 2024 – 2028.
- Weed control works focussing on: Turkey rhubarb (*Rumex sagittatus*), Green Cestrum (*Cestrum parqui*), Blue Heliotrope (*Heliotropium amplexicaule*), Balloon Vine (*Cardiospermum grandiflorum*), Moth Vine (*Araujia sericifera*), Passiflora caerulea (*Bluecrown Passionflower*), African Love Grass (*Eragrostis curvula*), Paterson's Curse (*Echium plantagineum*), Rhodes grass (*Chloris gayana*), Gelenia (*Galenia pubescens*), Prickly Pear (*Opuntia sp*.).
- Thinning targeting Bull-Oak (*Allocasuarina luehmanii*) and tea-tree (*Leptospermum polyanthum)* to facilitate natural regeneration.
- Monitoring of trial plots to establish the effectiveness of thinning Bull-Oak (*Allocasuaina luehmannii*) and tea-tree (*Leptospermum polyanthum*) species.
- Wild dog and fox baiting program during autumn and spring resulted in 3 wild dogs and 5 fox takes.
- 12 feral pigs controlled.
- Firebreak slashing along tracks and fence lines.
- Ground preparation for revegetation program of 6 ha (6,000 stems) of Central Hunter Grey Box Ironbark Woodland EEC.
- Six-monthly inspections.
- Ongoing ecological monitoring.

Monitoring Results

Monitoring in 2023 at the WBCA continued within the eight transects, consisting of six permanent monitoring transects established in 2015 and two new temporary revegetation plots established in 2019. The annual monitoring program was completed during spring and winter in the WBCA. The 2023 monitoring program included fauna and flora monitoring.

<u>Flora</u>

Below are key findings during the 2023 flora monitoring at the WBCA:

- 55 native and 35 weed species were detected, ranging from 26 (20 native, 6 weeds) in plot WOL03F to 31 (18 native, 13 weeds) in plot WOL04R. Relative to 2022, there was a decreasing trend in species diversity of native species and weeds in 2023.

- No threatened plant species were recorded within monitoring transects in 2023, however as in previous years the rare Hunter Valley endemics *Grevillea montana* and *Diuris sp. aff. dendrobioides* were detected.

- For Plant Community Types (PCT) 1605, only Native Ground Cover (other) for transect WOL02G exceeds benchmark values, but all other attributes are yet to approach them. For PCT 1658, Native Over-storey Cover, Native Ground Cover (shrubs) (NGCS) and Native Ground Cover (other) exceed benchmark values for some transects, but all others are below benchmark. Number of Tree Hollows and Fallen Logs for both PCTS are well below benchmark for all, but both will take considerable time to improve. For Revegetation transect WOL04R (also allocated to PCT 1658), only Native Ground Cover (shrubs) (NGCS) and Native Ground Cover (other) exceed benchmark values.

- Progress on natural regeneration of Warkworth Sands Woodland within the experimental thinning plots has been slow due to drought occurring between 2017 and 2019, returning variable results within plots relative to Target and Unthinned controls. Better growing conditions from 2020 to 2022 have resulted in encouraging trends in the recovery of thinned areas of both Bull-Oak and tea-tree, although a dry 2023 has again stalled progress.

- The mean floristic diversity of native species in Thinned plots of both Bull-oak and tea-tree is now higher than Unthinned and Remnant plots, and significant changes over time in overall floristic composition within Thinned plots can be demonstrated. The recent wetter conditions (2020-2022) have also improved germination and persistence of key species within the regenerating areas in thinned plots (e.g. *Acacia filicifolia, Grevillea montana, Pimelea linifolia, Brachyloma daphnoides*), and although some new recruitment of *Leptospermum polyanthem* has occurred, continual removal should ultimately lead to the elimination of this species from the area. No new recruitment has yet been observed in Bull-Oak plots.

- Monitoring of survey plots comprising the trial cultural burning program, commencing in September 2023, found significant differences in floristic composition and abundance at three months post-fire within *Angophora floribunda* woodland and *Eragrostis curvula* grassland, and good recovery from several key understory species.

Fauna

Below are key findings during the 2023 fauna monitoring at the WBCA:

- 48 bird species were recorded by census survey in 2023. Two new bird species were detected; the Australian Brush-turkey and the Flame Robin.

- Four threatened bird species were recorded in 2023; the Grey-crowned Babbler, Speckled Warbler, Flame Robin and Varied Sitella.

- Total bird species diversity for the WBCA is now 127 species. Highest bird species diversity at WBCA in 2023 was shared between a remnant woodland site (WOL02) and rehabilitation / regeneration site (WOL04).

- The performance target for WBCA bird species diversity is for regeneration site WOL04 to achieve comparable scores to remnant woodland sites.

- Echolocation call surveys for microbats recorded 9 species in 2023. While overall diversity appears high, the number of calls recorded was low. A total of 208 calls were recorded that were suitable for identification, with the highest number of calls recorded at remnant woodland sites in comparison to the rehabilitation /regeneration site WOL04.
- Reptile and frog activity was low in 2023 due to the drier conditions experienced.
- No evidence of the threatened Regent Honeyeater, Swift Parrot or the Large-eared Pied Bat were recorded in 2023.

A detailed list and location of fauna species recorded can be found in the Biodiversity Offset Monitoring Report which is available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/monitoring-documents).

Performance Against Criteria

During 2023, 15 of the 17 performance indicators were met and one was below the specific criteria (**Appendix C**).

Implemented/Proposed Improvements

Weed Management

The 2024 weed management strategy for WBCA will focus on the management of highest and high priority species identified in the *WBCA Operational Weed Management Action Plan 2024 – 2028*.

Pest Management

In 2024 pest control activities will continue to be implemented with additional opportunistic management also undertaken in response to sightings or evidence of pest species presence. Planned pest management activities include wild dog and fox baiting in collaboration with Local Land Services to maximise the effectiveness of the program.

Habitat Augmentation and Revegetation

In 2024 revegetation works will continue at the WBCA with planting of 6 ha (6,000 stems) of Central Hunter Grey Box Ironbark Woodland EEC.

General Management

Slashing of boundary fencing, tracks and annual weed infestations will be undertaken where feasible to minimise both bushfire risk and further spread of weeds.

Fence repairs will be undertaken on an as needs basis, as identified through inspection programs.

6.6.2.5 Weeping Myall Management Areas

The weeping myall (*Acacia pendula*) management areas are located on the western side of Bulga Coal, west of Charlton Road. These two stands are marked on **Figure 6.17** and are referred to as Weeping Myall Management Areas 1 and 2. These areas will be protected and managed by Bulga Coal, however they do not form part of a formal biodiversity offset.

The weeping myall (*Acacia pendula*) is an endangered population within the Hunter catchment, listed under the *NSW Biodiversity Conservation Act 2016* (BC Act). Management areas contain mature and juvenile weeping myall trees, the northern stand (WMMA # 1) supported relatively young trees and the southern stand (WMMA # 2) comprised very mature trees with no young plants.

Environmental Management

The activities that were undertaken within the two Weeping Myall Management Areas (WMMAs) during 2023 included:

- six-monthly inspections
- ongoing ecological monitoring.

Monitoring Results

Monitoring within the two WMMAs during 2023 has revealed few changes to either *Acacia pendula* individuals or the landscapes in which they occur, and most plants are in good health. Extensive coppice growth from root suckers is continuing to occur in both areas, but there remains no evidence of successful flowering, fruiting or new recruitment. Mistletoe continues to infest the larger individuals in WMMA # 2, and the presumed senescent specimen following recent drought is now in recovery mode with several root suckers, 1.7 m high, emanating from its base.

Flora

Below are key findings from the 2023 flora monitoring:

- Overall, floristic diversity and abundance within the two monitoring plots have shown a significant decrease due to dryer than average conditions.
- Numerical analysis of floristic compositions within these two plots over nine seasons showed significant differences in the diversity and abundance of species relative to rainfall received, with observable differentiation of the dry years of 2017 to 2019 and 2023 compared to the wetter years of 2015-2016 and 2020-2022.
- Five years after establishment, there has been an increase of up to 17% in the number of *Acacia pendula* stems evident within the growth monitoring plots established in 2018, but reductions of up to 25% since 2018 are also evident in some plots.
- The maximum height of Acacia within plots ranged from 2.5 to 3.5 m in 2023, showing a continuing increasing trend from baseline data in 2018 (1.0 – 1.6 m), with the tallest Acacia pendula individuals within experimental plots growing an average of 1.55 m over five years.
- Species diversity within all growth monitoring plots combined decreased for both native and weed species, reflecting the dry conditions. Following five years of monitoring, there are no significant differences in floristic composition between areas supporting developing stands of *Acacia pendula* and those where this species is absent (in either grassland, bare woodland or grassy woodland).

Implemented/Proposed Improvements

Bulga Coal will continue to monitor the WMMAs to address the general health of Weeping Myall plants, together with annual survey of floristic composition within two monitoring plots, and counts of *Acacia*

pendula stems and floristic composition within the twelve growth monitoring plots. Additionally, the following recommendations will be implemented:

- Monitor and manage African lovegrass (*Eragrostis curvula*) as necessary.
- Remove fallen timber and repair boundary fence near the gate in WMMA # 1.
- Continue to informally monitor for flowering on individual *Acacia pendula* trees.
- Continue to informally monitor the impact of mistletoes on older individuals of Acacia pendula within WMMA # 2.

6.6.2.6 Vere Offsets

The Vere BOA currently supports 153.8 ha of the Central Hunter Valley Eucalypt Forest and Woodland CEEC, listed under the EPBC Act. Active restoration management actions are proposed that will restore 54 ha of the site to CEEC condition. The conservation area also contains one recorded European heritage value site.

Environmental Management

During November 2023 a land management inspection was conducted at the proposed Vere BOA to establish future actions at the site including weed management, pest management and maintenance.

Key recommendations from The Vere Offset Area Property Inspection Report (Enright Land Management, 2023) include:

- Repair and install new fences.
- Detailed weed survey to develop the Vere Operational Weed Management Action Plan 2024 – 2028.
- Treat weeds including Golden Wreath Wattle (*Acacia Saligna*), Lantana (*Lantana montevidensis*), Green Cestrum (*Cestrum parqui*), African boxthorn (*Lycium ferocissimum*), Queensland Silver Wattle (*Acacia podalyriifolia*), Blackberry (*Rubus spp*.), Moth Vine (*Araujia sericifera*), Silky Oak (*Grevillea robusta*), Setaria (*Setaria sphacelata*), African Love Grass (*Eragrostis curvula*), Galenia (*Galenia pubescens*), Spiny Rush (*Juncus actus*), Prickly Pear (*Opuntia species*), Rhodes Grass (*Chloris gayana*), Blue Heliotrope (*Heliotropium amplexicaule*) and Ink Weed (*Phytolacca octandra*).
- Wild dog and fox baiting program during autumn and spring months resulted in 3 wild dogs, 2 fox and 1 feral pig takes.
- 2 feral pigs (*Sus scrofa*) controlled.
- Six-monthly inspections.
- Ongoing ecological monitoring.

Monitoring Results

The Vere is a new BOA added to Bulga Coal, with monitoring commencing in 2022. A large proportion of the Vere BOA currently comprises native vegetation and derived native grasslands of moderate to good condition, therefore the BOMP focusses on regeneration and revegetation strategies to enhance existing

communities and establish further native vegetation in degraded areas. These works will focus specifically on the Central Hunter Valley Eucalypt Forest and Woodland CEEC.

The offset monitoring program is outlined in the BOMP, requiring annual systematic ecological monitoring for the first 10 years (2022–2031), then every 3 years for the following 15 years.

Flora

Below are key findings from the 2023 flora monitoring:

- No new records of threatened plant species were recorded in 2023.
- A number of species present are planted stock within restored areas and do not naturally occur in the Broke locality. Sugar Gum (*Eucalyptus cladocalyx*) is a South Australian species not naturally found in NSW, and plantings of this species should be progressively removed and replaced with local endemic eucalypts.
- Other planted eucalypts including White Box (*Eucalyptus albens*) and Mugga Ironbark (*Eucalyptus sideroxylon*) should also be replaced.
- Most weed species are herbs and grasses typical of former grazing lands in the Hunter Valley.
- African Boxthorn (*Lycium ferocissimum*) and the non-endemic Silky Oak (*Grevillea robusta*) are abundant on and around plot Vere09 and in other areas, and represent the main woody weed species. Both should be progressively removed.
- As noted in 2022, there is some concern that flora monitoring plots are not representative of the PCTs they are intended to portray. These findings suggest that a review of the PCT allocations and mapping may be required to better inform future management and planned revegetation initiatives, and such a review could be incorporated into future monitoring events.

Fauna

Below are key findings during the 2023 fauna monitoring:

- Six threatened species were recorded, including 2 birds and 4 microbats. Bird species diversity measured at each monitoring site revealed significantly lower scores in 2023 compared to 2022.
- The Derived Native Grassland Revegetation and Remnant Woodland sites recorded comparable scores in 2023, although overall the sites recorded lower scores. However, this analysis is based on only two years of monitoring, which can limit the determination of ecological trends.

Implemented/Proposed Improvements

Weed Management

The 2024 weed management strategy for Vere BOA will focus on the management of highest and high priority species identified in the *Vere BOA Operational Weed Management Action Plan 2024 – 2028*.

Pest Management

In 2024 pest control activities will continue to be implemented with additional opportunistic management also undertaken in response to sightings or evidence of pest species presence. Planned pest management

activities include wild dog and fox baiting in collaboration with Local Land Services to maximise the effectiveness of the program and pig trapping.

General Management

Slashing of boundary fencing, tracks and annual weed infestations will be undertaken where feasible to minimise both bushfire risk and further spread of weeds.

Fence repairs and tracks maintenance will be undertaken on an as needs basis, as identified through inspection programs.

6.7 Weeds and Pests

6.7.1 Environmental Management

An ongoing weed control program was carried out by licenced contractors. Annual buffer land inspections monitor success of any previous weed control and identify areas which will require additional treatment. Major efforts were implemented in 2023 to conduct weed management by prioritising the significance, timing and treatment method.

Land management contractors were engaged by Bulga Coal to undertake vertebrate pest control programs in autumn, spring and summer in conjunction with the coordinated program being organised by Local Land Services, where possible. As part of the program, 1080 baiting was conducted, targeting wild dog and fox populations within the landholdings. Pig trapping targeted populations travelling through buffer lands and BOAs (Broke Road, Condran and Reedy Valley).

6.7.2 Environmental Performance

Annual buffer land inspections generally indicate that weed management is successful, but ongoing monitoring and treatment is required to prevent further infestations.

The 1080 baiting program was undertaken in autumn and spring across Bulga Coal. The autumn program included a total of 192 baits laid with a total of 34 baits taken, which represented 18% of the available baits and a decrease on the 2022 results. The spring baiting program had 33 baits taken by target species which represented 17% of the available. This was in general lower than the previous year's results.

6.7.3 Implemented/Proposed Improvements

Weed management in 2024 will be conducted as per prioritisation and the schedule defined in the *Buffer Land Operational Weed Management Action Plan 2024 – 2028*.

6.8 Archaeology and Heritage

6.8.1 Environmental Management

Bulga Coal continues to work with the Registered Aboriginal Parties (RAPs) regarding aspects of Aboriginal heritage and the implementation of the *Bulga Coal Aboriginal Cultural Heritage Management Plan* (ACHMP).

Bulga Coal manages European (historical) heritage through the implementation of the *Historic Heritage Management Plan* (HHMP).

6.8.2 Environmental Performance

6.8.2.1 2023 Quarterly Monitoring

A program for quarterly monitoring of Aboriginal heritage sites began in 2013 at Bulga Coal. Monitoring of Aboriginal heritage sites in conjunction with (up to) four RAPs and an OzArk archaeologist was continued in 2023. Quarterly monitoring reports are available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/monitoring-documents) and the results are summarised as:

- Quarter 1 monitoring was undertaken on 15 March 2023. The inspection included review of sites at the WBCA.
- Quarter 2 monitoring was undertaken on 15 May 2022, this included a review primarily of sites at the Loders Creek Grinding Grooves Relocation Area (LCGGRA) and to the west of Charlton Road.
- Quarter 3 monitoring was undertaken on 22 August 2023 which included a review primarily of sites Northeast of Charlton Road as well as proactive management at sites to slow erosion. The erosion control work involved land management contractors felling juvenile Casuarina from near sites and then all personnel placing the felled Casuarina in bunds along contours at vulnerable sites to slow down the flow of water.
- Quarter 4 monitoring occurred on 21 November 2023. This monitoring was focused on sites to the northeast of Bulga Coal and south of Broke Road.

6.8.2.2 New Aboriginal Heritage Sites

No new Aboriginal heritage sites were found in 2023.

6.8.2.3 Salvages During 2023

No salvages occurred during 2023.

6.8.2.4 Wollombi Brook Conservation Area

The WBCA is both a biodiversity offset area and an Aboriginal and Cultural Heritage Offset Area. Heritage is managed in accordance with the *Wollombi Brook Plan of Management* (Appendix J of the ACHMP). Land management is undertaken in accordance with the BOMP.

The Minimbah Teaching Place was built in December 2021 and is in the WBCA. The facility is being used by the community to learn about local Aboriginal culture and history. There is access to the waterhole in Wollombi Brook and interpretive signage telling the Wonnarua stories.

On 28 March 2023 all previously salvaged Aboriginal artefacts were moved to Minimbah for safe storage. This occurred in accordance with a Care Agreement (No. 5009) from Heritage NSW. Between 30 October and 1 November the artefacts were then curated in a program which was overseen by OzArk and RAPs. The curation program consisted of RAPs opening up all boxes of stored artefacts from Bulga Coal and then going through the bags to identify artefacts that they felt would contribute to a teaching program (**Photo 6.1**).

On 1 December 2023 the Annual Aboriginal Stakeholder meeting was also held at the Minimbah Teaching Place (**Photo 6.2**). Following the meeting there was a working bee to commence the bush tucker garden (**Photo 6.3**).

Photo 6.1 Cataloguing salvaged artefacts with RAPs at Minimbah Teaching Place 2023

Photo 6.2 Annual Aboriginal Stakeholder Meeting at Minimbah Teaching Place 2023

Photo 6.3 Working bee with RAPs on the bush tucker garden at Minimbah Teaching Place 2023

6.8.2.5 Loders Creek Grinding Grooves Conservation Area

On 3 November 2022 the LCGGCA Agreement was executed by Heritage NSW. The LCGGCA is an Aboriginal and cultural heritage conservation area. Heritage is managed in accordance with the *LCGGCA Plan of Management* (Appendix K of the ACHMP). Land management is undertaken in accordance with the BOMP.

Photographic monitoring of the LCGGCA occurs annually, and the site is monitored once a year as part of the Quarterly Monitoring Program. In May 2023, the four fixed points were photographed to monitor the condition of the Loders Creek Grinding Grooves. There are 5 main groups of grooves within the site (Groups A to E). The site was originally photographed in September 2015 following the relocation, and annually between 2017 and 2023. In summary, the 2023 monitoring showed that natural weathering is occurring to the Group A and Group D grooves. Group A has a layer of sandstone starting to exfoliate and Group D grooves are weathering and becoming less obvious. Despite weathering, the grooves remain in good condition and no further management is required. All results from the monitoring are presented in **Appendix E**.

6.8.2.6 Incidents

No heritage related incidents occurred during 2023.

6.8.3 Implemented/Proposed Improvements

Quarterly monitoring of Aboriginal sites in consultation with RAPs will continue in 2024. Bulga Coal will also continue to work with the Aboriginal community on Minimbah Teaching Place projects including bush tucker gardens, walking trails, signage and educational resources.

6.9 Visual and Lighting

6.9.1 Environmental Management

Control strategies are implemented to reduce potential visual and light related impacts associated with mining operations. Management is undertaken in accordance with the *Bulga Lighting Plant Procedure* and the *Visual Impact Management Plan* (VIMP) which was revised in 2023 and was approved by DPHI on 10 August 2023. The revised VIMP includes additional visual screening along Broke Road.

Visual and lighting impacts are assessed through monitoring and inspection regimes. Onsite monitoring includes assessments of lighting impacts, compliance with development consent conditions and the angle at which light is emitted from lamps and luminaries, glare, spill and sky glow.

6.9.2 Environmental Performance

Potential lighting impacts are assessed as part of the overburden dump design process. Dumps are orientated, where practicable, and windrows or bunds are designed and constructed to mitigate lighting impacts.

A sensitive lighting receiver map is updated and communicated to mining personnel prior to commencing exposed dumps that have the potential to cause lighting impacts offsite.

Construction of the additional visual screening along Broke Road was completed in 2023.

6.10 Spontaneous Combustion

6.10.1 Environmental Management

Spontaneous combustion is managed in accordance with the *Spontaneous Combustion Management Plan*. Inspections of potentially affected areas are conducted during each shift. Spontaneous combustion incidents at Bulga Coal are predominantly associated with coal stockpiles.

Portable gas monitoring units are used by units working in areas of spontaneous combustion or where toxic gases are suspected of being present. This is for the purpose of identifying the presence of spontaneous combustion and any potential increase in risk.

6.10.2 Environmental Performance

Four incidences of spontaneous combustion occurred in 2023; one on the product stockpile, one on the raw coal stockpile and two on the ROM stockpile. In each instance, the hot material was treated as per the *Spontaneous Combustion Management Plan.*

6.11 Bushfire

Environmental Management

Bushfire management strategies and monitoring are undertaken at Bulga Coal in accordance with the *Bushfire Management Plan* which was updated in November 2023. The revisions included updates to

mining and operational areas, contact details for neighbours/lessees contact numbers were updated on the Bushfire Operations Plan and personnel details were updated on the RFS Communication Plan. The revised documents were provided to the Rural Fire Service (RFS).

The following activities were undertaken during the reporting period:

- Consultation with RFS to provide the latest version of the Bushfire Management Plan.
- Annual fire season review completed including currency of contacts and refuge points, GIS database and works required prior to the bushfire season.
- Monitoring of fuel loads in areas that adjoin Charlton Road and the former Broke Road, private property boundaries, tenanted properties and mine owned assets.
- Monitoring of tracks and trails within the Bulga Coal colliery holding to ensure these remain accessible by checking for fallen logs, erosion or other signs of trail degradation.
- Monitoring of weather conditions.
- Hazard reduction measures were implemented including slashing powerline easements, access tracks and boundaries of adjoining land holdings.

6.11.1 Environmental Performance

No bushfires were recorded on the site.

6.11.2 Implemented/Proposed Improvements

Bulga Coal continued to maintain existing fire breaks and monitor fuel loads.

6.12 Greenhouse Gas Emissions

6.12.1 Environmental Management

Bulga Coal implements controls to mitigate air quality impacts in accordance with the *Air Quality and Greenhouse Gas Management Plan*. The *Air Quality and Greenhouse Gas Management Plan* was revised in 2020 for SSD-4960 Modification 3 and DA 376-8-2003 Modification 7, and was approved by DPHI in May 2022.

Bulga Coal use both pre-mining and post-mining gas drainage to provide a safer, more productive mining environment. Pre-mining drainage wells extract methane and carbon dioxide from the coal seams which is piped to the 9-Megawatt (MW) gas fired power station or Flaring Facility where it is converted to carbon dioxide.

The underground goaf atmosphere is managed with the post-mining gas drainage infrastructure. This helps reduce the potential for spontaneous combusting within the sealed underground workings and potential leakage of methane from the sealed workings intercepted by open cut mining.

Post-mining drainage methane and carbon dioxide is extracted from the mined out goaf and is sent to the Post-drainage Flaring Facility for combustion of the methane. This conversion of coal seam methane gas to carbon dioxide gas and water substantially reduces greenhouse gas emissions from the Bulga Underground Operations.

Methane and carbon dioxide levels are measured in the gas drainage operations. The gas drainage operations have monitoring at the gas wells and the flaring facilities. The gas composition and flow rate are trended in the site's continuous monitoring system, and long-term data stored offsite in a database.

6.12.2 Environmental Performance

6.12.2.1 Reported Greenhouse Gas Emissions

Bulga Coal reports greenhouse gas emissions (GHG) in accordance with National Energy and Greenhouse Gases (NGER) legislation. Each financial year Bulga Coal is required to submit to the federal government the emissions from their NGERs registered facility. Also, because Bulga Coal emits over 100 kt of $CO_{2\text{-}e}$ each year, Bulga Coal is registered as a Safeguard facility and therefore also had a Safeguard baseline. Emissions above the baseline for that year need to be offset by retiring Australian Carbon Credit Units (ACCUs).

The NGERs reporting year is based on a financial year, not a calendar year such as this Annual Review. To prevent incompatible public reporting, the values in this report also cover a financial year. **Table 6.25** contains the Scope 1 (direct emissions from the mining activities during the year), and Scope 2 emissions (electricity consumption by the mine during the year).

Table 6.25 Bulga Coal Greenhouse Gas Emissions (Scope 1 and 2 Direct Emissions) FY 2022/2023

Emissions	Bulga Coal (t $CO_{2\text{-}e}$)			
	2020/2021	2021/2022	2022/2023	Predicted maximum annual totals
Total Scope 1 Emissions	***516,614***	***474,479***	***512,403***	***1,011,888***
Total Scope 2 Emissions	***42,420***	***46,126***	***68,916***	***55,042***
Total Emissions (Scope 1 and 2)	**559,034**	**520,605**	**581,319**	**1,066,930**

Note – The predicted maximum annual total includes 1,066,930 t CO_2-e (1,011,888 t $CO_{2\text{-}e}$ Scope 1 and 55,042 t $CO_{2\text{-}e}$ Scope 2) from the Greenhouse Gas and Energy Assessment for the Bulga Optimisation Project EIS and excludes the Bulga Underground Operations and the additional emissions associate with SSD-4960 Modification 3. . The annual emissions included in Table 6.25 also include the emissions from the remnant underground gas drainage.

Overall, there was an increase in Bulga Coal emissions of approximately 10% when compared to the 2021/2022 reporting period. The increase is attributable to increased fugitive emissions from ROM coal. Over the 2022/2023 period Bulga mined coal in areas of the mine which have higher gas zones compared to the 2021/2022 period.

6.12.2.2 Comparison Against Predictions

A Greenhouse Gas and Energy Assessment was prepared for Bulga Coal by Umwelt (2012) as a component of the Bulga Optimisation Project EIS. The assessment does not include the emissions associated with the Bulga Underground or the additional emissions associate with SSD-4960 Modification 3 which includes the relocation of approximately 30M m^3 of tailings with electric pumps which generate considerable additional Scope 2 emissions. A comparison against the predictions of the Greenhouse Gas and Energy Assessments is included in **Table 6.25**.

Predictions represent the maximum annual greenhouse gas emissions for Bulga Coal during operations. The Total Emissions (Scope 1 and 2) are approximately half (54%) of the predicted maximum total included in the Bulga Optimisation Project EIS prediction for the Open Cut operations. The lower than predicted emissions is primarily due to the deeper coal (which is higher in emissions) not being mined yet. The Scope 2 emissions have increased largely due to the additional electricity consumed to relocate tailings from the Deep Pit to the NTSF.

6.12.3 Implemented/Proposed Improvements

Bulga Coal is a part of the wider coal assets held by Glencore across Australia. Glencore Coal Assets Australia (GCAA) are themselves a part of the global Glencore mining portfolio. In line with the ambitions of the 1.5°C scenarios set out by the Intergovernmental Panel on Climate Change (IPCC), Glencore target a short-term reduction of 15% by 2026 and a medium-term 50% reduction of our total (Scope 1, 2 and 3) emissions by 2035 on 2019 levels. Post 2035, Glencore's ambition is to achieve, with a supportive policy environment, net zero total emissions by 2050.

Glencore incorporates energy costs and our carbon footprint into our annual planning process. Commodity departments, such as GCAA, are required to provide energy and GHG emissions forecasts for each asset over the forward planning period and provide details of emissions reduction projects. In the case of Bulga Coal this includes involvement with GCAA when considering available GHG abatement technology and mine planning to optimise efficiency (which usually translates into reduced fuel consumption).

Glencore open cut and underground sites minimise emissions from diesel and electricity consumption by:

- Optimisation of mining practices e.g. haulage planning, blast design, conveying arrangements.
- Optimisation of engine performance e.g. studies undertaken in collaboration with OEMs to enhance fuel efficiency and emissions reduction.
- New fleet is purchased with the most fuel-efficient engines available.
- Ongoing monitoring of potential biofuel and fuel additive opportunities.
- Ongoing monitoring and assessment of emerging technologies.

6.13 Hydrocarbon Management

6.13.1 Environmental Management

Controls implemented to manage the risk of hydrocarbon related impacts are conducted under the:

- *Bulga Coal Hydrocarbon Management Plan*, incorporating spill response procedure and Bulga Open Cut Hydrocarbon TARP.
- *Bioremediation Area Management Plan*.
- *Bulga Coal Pollution Incident Response Management Plan*.

Hydrocarbon storage facilities have been designed generally in accordance with AS 1940-2004 – *'The Storage and Handling of Flammable and Combustible Liquids'*. The storage system includes computerised controls for the purpose of monitoring and identification of faults.

Bulga Coal monitor for petroleum hydrocarbons at dirty water dams, EPL discharge points and groundwater bores surrounding hydrocarbon storage and natural watercourses, in accordance with *the Bulga Open Cut Remediation Action Plan* and the *Bulga Coal Hydrocarbon Management Plan*. The monitoring program involves:

- Regular inspections of hydrocarbon infrastructure to identify losses or leakages.
- Monthly oil and grease analysis at the surface water monitoring sites shown on **Figure 6.18**.
- Hydrocarbon monitoring at the locations listed in **Table 6.27**. Surface water sites are monitored quarterly, following rain. Groundwater sites are monitored six-monthly.

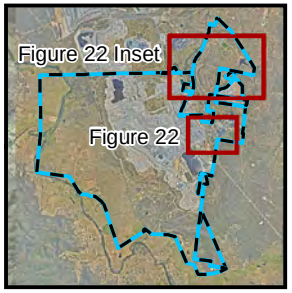
Bulga Coal

FIGURE 6.18 - Bulga Coal Hydrocarbon Surface and Groundwater Monitoring 2023

GLENCORE

Legend

- Mining Lease
- Hydrocarbon Groundwater
- Hydrocarbon Surface Water
- Local Roads
- Watercourse
- Railway



GDA2020

Date Created: 18/03/2024
Map Size: A4 Landscape
Scale: 1:10,000
Map Created By: rabbott
Coordinate System:
GDA2020 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA2020

File Path Ref: Q:\03_MapDocuments\18_Reporting\Annual_Review\2023\AR FIGURES\20240201_Figure_6_18_AR_Hydrocarbon_Surface_Groundwater_Monitoring_A4_GDA2020.mxd

6.13.2 Environmental Performance

Surface water and groundwater monitoring was conducted at the locations listed in **Table 6.26** and shown on **Figure 6.17**. Results were assessed against the Hydrocarbon Trigger Action Response Plan (TARP) triggers in **Table 6.27**.

Table 6.26 Hydrocarbon Monitoring Sites

Type	Monitoring Location
Groundwater	ASMW02
	ASMW06
	ASMW07
	C2MW03
	C2MW04*
	C3MW01
Surface Water	NMC4
	NMC5
	NMC6
	NMC Culvert
Licenced Discharge Point (LDP)	Northern Dam (ND1)
Onsite Dirty Water Dam	AS Dam 1
	AS Dam 2
	AS Dam 3
	C2 Dam
	C3 Dam

* C2MW04 was decommissioned in September 2023 following the commissioning of the Nine Mile Creek clean water management system upgrades and Dam C3A.

Table 6.27 Ecological Investigation Levels (ANZECC) Adopted for Natural Waters (Surface and Groundwater) at Bulga Open Cut

Sampling Location	Contaminant	Trigger (µg/L)
Surface Water NMC4, NMC5, NMC6, Nine Mile Creek Culvert, ND1. Groundwater ASMW02, ASMW06, C2MW03, C2MW04, C3MW01.	TRH C6-C10	20 (LOR)
	TRH >C10-C16	100 (LOR)
	TRH >C16-C34	100 (LOR)
	TRH >C34-C40	100 (LOR)
	TRH >C10-C40	300 (LOR)
	Naphthalene	16
	Phenanthrene	0.6
	Anthracene	0.01
	Fluoranthene	1
	Benzo(a) pyrene	0.1

Groundwater monitoring results in 2023 were below the ecological investigation levels.

Surface water monitoring results from the Nine Mile Creek monitoring sites and the Northern Dam were also below the ecological investigation levels.

Hydrocarbon spills were contained, cleaned-up and bioremediated or transported offsite as hazardous waste by a licensed waste contractor.

6.13.3 Implemented/Proposed Improvements

A new bulk fuel facility and a new light vehicle workshop will be constructed in the East Pit to replace the existing infrastructure in the Area Station.

A new ultra-class workshop is being constructed within the maintenance workshop area.

The decommissioning of the bulk hydrocarbon storage area near the old underground access was completed in December 2023, to allow for the southerly progression of the pit.

6.14 Public Safety

6.14.1 Environmental Management

Controls implemented to minimise the potential for public safety incidents include:

- Implementation of a security system. These systems and procedures have been established in accordance with the relevant requirements under the *Work Health and Safety Act 2011*, *Mining Act 1992* and conditions stipulated in the relevant mining tenements.
- Using sentries to prevent unauthorised entry into the blast exclusion zone.
- Using traffic control when working near public roads.
- Maintaining a fence around the perimeter of mining operations.

6.14.2 Environmental Performance

There were no public safety incidents recorded at Bulga Coal during the reporting period. Management measures and control strategies implemented at Bulga Coal have been effective in the prevention of incidents regarding public safety during the reporting period.

There were no changes to public safety management in 2023.

7.0 Water Management

7.1 Water Management

The 2023 reporting period was a drier than average year with total annual rainfall at Bulga Complex Weather Station being 524 mm which was less than half the 1,225 mm recorded in 2022. The surface and groundwater monitoring data reflects the natural response to a dry year after two years of greater than average rainfall.

7.1.1 Water Balance

Bulga Coal uses a water balance model to assist in the management of water onsite. The model is used to review performance and undertake short term projections (12 months) of water requirements. The model is also used to predict water needs for the life of the mine. Major water transfers are monitored via flow meters. Water storage volumes are monitored with level sensors or measured fortnightly.

The water balance for Bulga Coal is presented in **Table 7.1**. The discrepancy between inflows, outflows and change in storage is due to the limitations of the accuracy of the surface and groundwater storage measurements, and water balance model predictions.

Table 7.1 Bulga Coal 2023 Water Balance

Bulga Coal 2023 Water Balance	Volume (ML)
Water Inventory and Capacity	
Total estimated water stored on site 1 January 2023 (11,745 ML predicted to be in the underground goaf)	22,192
Total estimated water stored on site 31 December 2023 (10,699 ML predicted to be in the underground goaf)	22,851
Change in water inventory	659
Inflows	
Water extracted from Hunter River (monitored)	2,210
Rainfall and runoff intercepted from mine areas	3,696
Groundwater inflow (Groundwater model prediction)	1,178
Pumped from dewatering bores (drawing on water stored in the underground goaf)	2,106
Water entrained in CHPP feed material	494
Water entrained in dredged tailings	2,291
Potable supply	10
Mt Thorley Mine water supply	2,486
Total Inflows	**14,471**
Outflows	
Evaporation	4,847
Discharge to Hunter River under Hunter River Salinity Trading Scheme	0
Discharge via spill	0
Water entrained in product coal, coarse rejects and tailings (including Deep Pit tailings relocation)	7,362

Bulga Coal 2023 Water Balance	Volume (ML)
Open Cut Dust suppression	1,246
Bulga Underground Operations Water Consumption	0
Potable water consumption	10
Other losses	5
Total Outflows	**13,470**

7.1.2 Licensed Water Take

Water taken by Bulga Coal during the previous water year (1 July 2022 to 30 June 2023) is summarised in **Table 7.2**.

Table 7.2 Water Take 2022-2023

Water Licence #	Water Sharing Plan, Source and Management Zone	Entitlement (ML)	Total entitlement under Source	Passive take/ inflows	Active Pumping	Total
Groundwater						
WAL41687	Mining: Sydney Basin-North Coast Groundwater Source	500	2,365	995	21	1,016
WAL41546	Mining: Sydney Basin-North Coast Groundwater Source	365				
WAL41543	Mining: Sydney Basin-North Coast Groundwater Source	500				
WAL41544	Mining: Sydney Basin-North Coast Groundwater Source	500				
WAL41545	Mining: Sydney Basin-North Coast Groundwater Source	500				
WAL36221	Mining: Wollombi Brook Aquifer leakage to Permian coal measures	300	300	0	0	0
Surface Water						
Singleton Council Agreement	Hunter River	2,457*		0	2,210	2,210

*This is the annual Singleton Council agreement allocation (867 ML) along with an additional 1,590 ML temporary transfer from Resource Pacific Pty Ltd (Ravensworth Mine) under licence 20AL203244. Bulga did not transfer water to other mines in 2022/2023.

7.2 Surface Water

Bulga Coal implements surface water management measures in accordance with the *Water Management Plan* (WMP). This Plan outlines procedures for the detection of significant offsite impacts. The Plan also outlines trigger levels to identify and manage potentially adverse impacts. Trigger levels are included in the site Environmental Monitoring Database (EMD), which generates an alarm if a trigger level is reached. The WMP further outlines the methods for monitoring the quantities of water extracted, imported or discharged under groundwater extraction licences, surface water extraction licences and the EPL.

Monthly surface water quality monitoring is undertaken at dams, streams and creeks in and around Bulga Coal mining operations. Monitoring locations were selected to obtain representative samples. Water quality parameters including temperature and depth are tested onsite, whilst pH, electrical conductivity (EC), and total suspended solids (TSS) are undertaken by a National Association of Testing Authorities (NATA) accredited laboratory.

Surface water quality monitoring is conducted in accordance with:

- AS 5667.4 – 1998 *Water Quality Sampling – Guidance on Sampling from Lakes, Natural and Man-made*.
- AS 5667.6 – 1998 *Water Quality Sampling-Guidance on Sampling of Rivers and Streams*.
- The *Bulga Coal Water Management Plan*.

The WMP was approved by DPHI in 2021.

7.2.1 Environmental Management

A summary of surface water monitoring results against relevant criteria from the WMP is provided in **Table 7.3**. The location of surface water monitoring sites is shown on **Figure 6.3.** Monitoring data is available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/monitoring-documents). Jacobs have produced the *Bulga Coal Complex Annual Surface and Groundwater Monitoring Report* (Jacob, 2024) which is attached as **Appendix D**.

7.2.2 Environmental Performance

Table 7.3 Summary of Surface Water Monitoring Results – 2023 Annual Averages

Sample Point	pH (range Min-Max)	pH Criteria		EC (µS/cm)	EC Criteria (µS/cm)	TSS (mg/L)	TSS Criteria (mg/L)
		Lower 20th percentiles	Upper 80th percentile		80th percentile		80th percentile
LR1[1]	6.9–7.6	7.12	7.81	633	944	8	12
LR2	7.7–8.2	7.39	7.91	5,185	4,924	13	40
LR5	7.3-8.0	7.41	7.98	1,130	1,350	9	12
W2	7.3-7.8	7.13	7.67	880	836	8	12
W4	7.2-8.6	7.33	7.87	840	947	7	10
SDL1[4]	-	6.70	7.24	-	285	-	39
NDL1	8.2–8.3	7.14	7.26	3,765	399	51	70
W9[3]	7.8–8.3	7.36	7.92	9,219	1,970	11	157
W10	7.9–8.7	7.00	7.64	9,630	691	23	102
NMC1[2]	7.5–8.7	-	-	554	-	58	-

[1] Site is upstream of the operations and is used as a reference site.

[2] Insufficient data to establish criteria.

[3] W9 replaced W8 as it was mined through.

[4] SLD1 remained dry, or with very low water levels to sample throughout the year.

7.2.2.1 Surface Water pH

In 2023 pH trend tended to be higher than 2022. Measured pH ranged from a maximum of 8.7 at W10 east of the BCC, to a minimum of 6.9 at LR1 south of the BCC. pH trends to the end of the reporting period are attached in Appendix B of the *Annual Surface and Groundwater Monitoring Report 2023*.

Many of the monitored watercourses were dry or were unable to be sampled throughout 2023. As a result, when they were sampled, pH was often above the adopted trigger range.

Surface water pH has been compared to trigger values from the adopted WMP (Bulga 2021). Trigger values for pH have been determined by using 80th and 20th percentile of previously recorded values and are summarised in the Bulga Coal WMP (Bulga 2021). Eight of the nine sample locations recorded values outside of respective surface water pH trigger levels throughout the year.

Most sites exceeded trigger levels for the majority of 2023 but are within historical ranges. Deviance from the trigger ranges are attributable to natural variations in watercourse conditions throughout the year, with many of the sites having dried up at some point. pH exceedances of the adopted trigger ranges is expected during drier periods like 2023 when carbonates concentrate in water due to evaporation. Therefore, it is unlikely that these exceedances reflect mining activity.

7.2.2.2 Surface Water EC

Historic surface water EC trends mostly continued into 2023, as all sites show significant variability in EC over the 2023 monitoring period. This variability is evident with a general trend of increasing EC in surface waters throughout 2023 in response to the below average rainfall. Measured EC ranged from a maximum of 13,000 µs/cm at W10 east of the BCC, to a minimum of 383 µs/cm at NMC1, south-east of the BCC. Graphs of EC trends to the end of the reporting period are attached in Appendix B of the *Annual Surface and Groundwater Monitoring Report 2023* (**Appendix D**).

Many of the monitored watercourses were dry or were unable to be sampled throughout 2023. As a result, when they were sampled, EC was often above the adopted trigger range.

Surface water electrical conductivity (EC) has been compared to trigger values from the adopted WMP (Bulga 2021). Eight of ten monitored sites exceeded the adopted trigger level during sampling events in 2023.

EC of surface water measured at most sites increased throughout the year reflecting increasing salt concentrations through evaporation due to the drier than average conditions. The drier than average conditions resulted in five of the six waterways drying up or being too low to sample throughout 2023.

Surface water locations with exceedances are attributed to the climate and the elevated values are unlikely to be due to mining impacts.

7.2.2.3 Surface Water TSS

Historic TSS trends mostly continued into 2023 with all sites showing similar variability in TSS, as previously reported. Graphs of TSS trends to the end of the reporting period are attached in Appendix B of the *Annual Surface and Groundwater Monitoring Report 2023*.

TSS in Wollombi Creek was generally low, with multiple trigger exceedances occurring late in 2023. Consistent with historic trends, TSS at most other sites was significantly higher than those at Wollombi Brook; however below the adopted WMP trigger values for the length of the reporting period.

TSS has been compared to trigger values from the adopted WMP (Bulga Coal WMP 2021). All monitoring locations remained within trigger ranges and historic ranges during the year, with the exception of the Northern Drainage Line. The Northern Drainage Line was dry or close to dry throughout much of the reporting period and exceedances could reflect disturbances during sampling given the TSS returned below the trigger value in the following month. TSS values at all other sites were the most part within the trigger ranges assigned by the adopted WMP.

7.2.2.4 Stream Flow in Wollombi Brook

Stream flow impacts in Wollombi Brook from Bulga Coal are determined by comparing the Water NSW gauging station records, upstream and downstream of the site. The upstream site is the Wollombi Brook – Brickmans Bridge (Paynes Crossing) gauging station (210135), which is located approximately 20 km upstream of Bulga Coal. The downstream site is the Wollombi Brook – Bulga gauging station (210028), located approximately 5 km downstream of Bulga Coal. **Figure 7.1** and **Figure 7.2** show the gauging station records for 2020 to 2023 for the upstream and downstream sites, respectively.

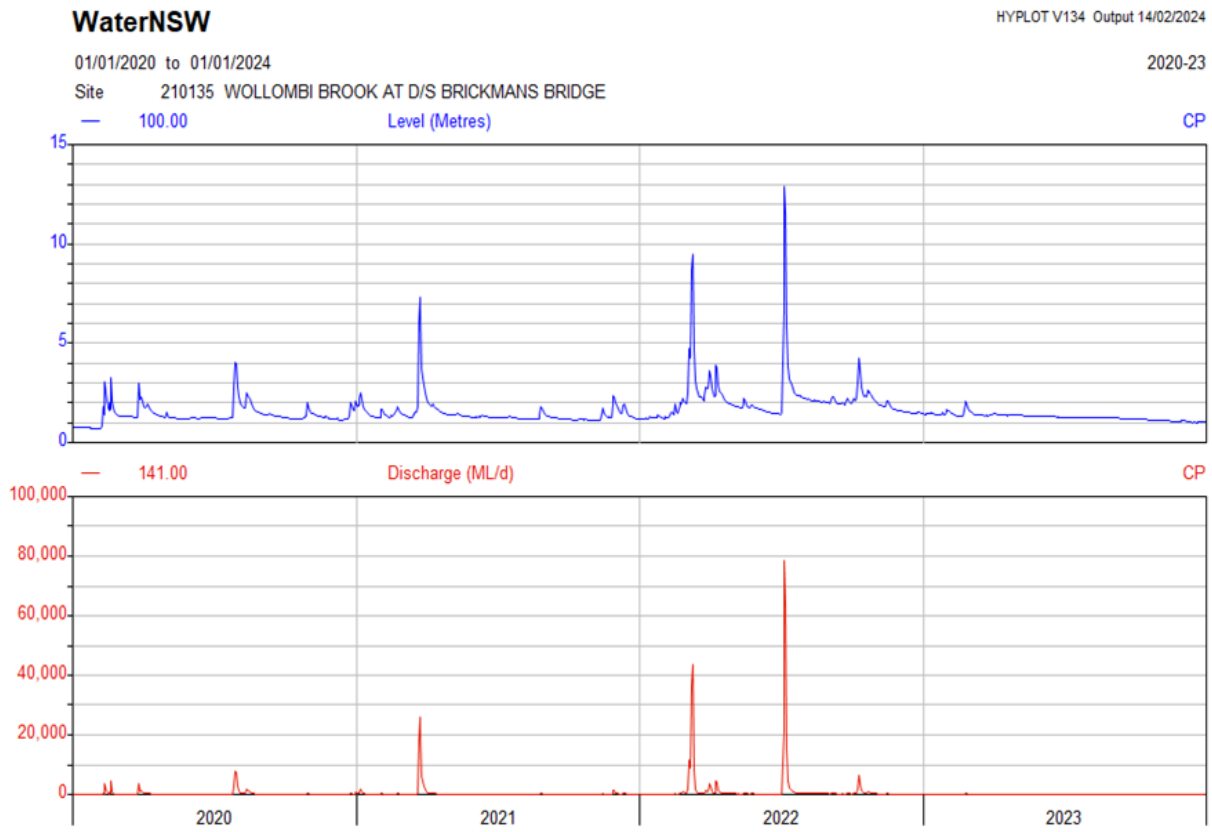


Figure 7.1 Wollombi Brook Brickmans Bridge Gauging Station (210135)

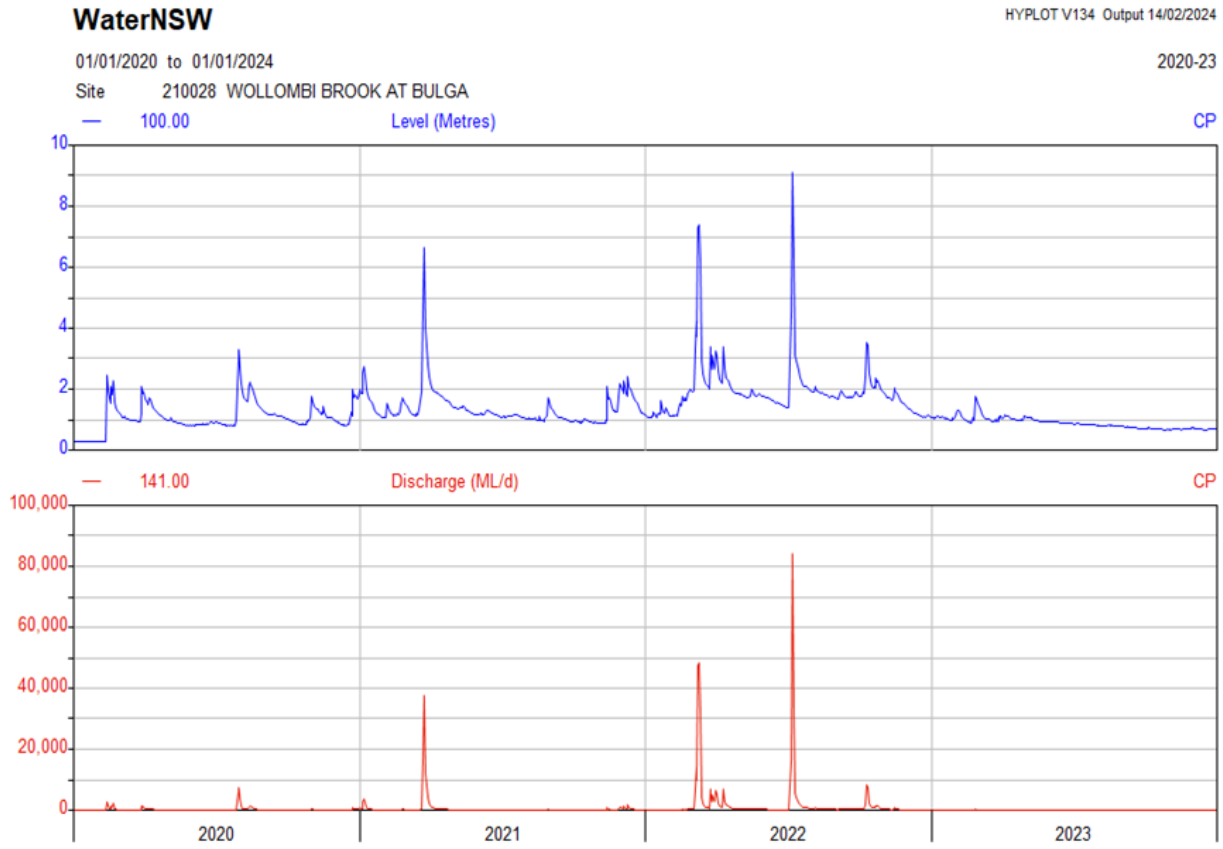


Figure 7.2 Wollombi Brook – Bulga Gauging Station 210028 (Downstream)

The data presented in **Figure 7.1** and **Figure 7.2** indicates that the water level in Wollombi Brook increased over the 2020–2022 period due to consistent rain. During 2023 flow and levels remained very low compared to previous years. This is directly attributed to the lower than average rainfall during 2023.

7.2.2.5 Hunter River Salinity Trading Scheme

The site has one Hunter River Salinity Trading Scheme (HRSTS) discharge point, EPL ID 11 – Northern Dam.

EPL 563 requires the discharge volume, pH, TSS and turbidity to be monitored during discharge events. There were no discharges from the licenced discharge points during 2023.

On 5 March 2023 a power outage at the Northern Dam caused damage to the Water NSW modem due to the backup battery voltage being low. Once the power was reinstated the Water NSW telemetry system was not operational. Following the investigation, it was found that the existing back up power unit had capacity to power the telemetry system for at least 5 days. However, the water level pump for the dam was taking power from the backup supply, ultimately draining the battery and causing the low voltage damage to the modem.

Actions and improvements implemented to prevent the recurrence included:

- replacement and upgrade of the Water NSW modem with a 4G modem
- low voltage cut off protection installed for the modem

- upgrade of the backup battery system to a two battery system supplying 240 AH, giving 10 days of run time
- upgrade of the dam level pump enclosure to a 6 mm power cable
- upgrade of the dam level power supply to an independent 12 v power supply, and an external secure battery storage with a solar panel and solar charger controller.

7.2.2.6 Channel Stability Monitoring Results

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) Ephemeral Stream Assessment Methodology was used to assess the channel stability of Nine Mile Creek, Loders Creek and Wollombi Brook. The assessment uses indicators (vegetation presence, shape and profile, type of materials, nature of walls etc.) to produce a rating which ranges from Very Stable to Very Active.

While there were some minor changes to individual CSIRO category scores for the 2023 survey, the overall CSIRO ESA site ratings remained unchanged. These results reflect the consistency in riparian and channel conditions over the past year, much of which can be attributable to a lack of sporadic, flashy flow events and effects of runoff into catchment drainages. Sources of fine silt to the creekline occur from exposed and active erosion scars along the upper bank Loder Creek bank edges, from slumped trees or from tracks formed by ongoing animal use (kangaroos, livestock or wild pigs), with mobilisation of sediments occurring via lateral inflows to the creek or from longitudinally scouring flow events within the main creek channel. At several locations in upper Loder Creek (between LC4 and LC7), fine colluvial sediments accumulated at the bases of the bank slopes have become colonised by vegetation (mostly couch grasses and spiny rushes), which had showed renewed growth in 2023, presumably from recent rainfall events.

7.2.2.7 Stream Health

The Rapid Appraisal of Riparian Condition (RARC) is an assessment method incorporating indicators of geophysical, and biological properties and processes which are likely to provide reliable estimate of ecological condition in riverine ecosystems (Jansen et al, 2005). Each indicator is given a score which combine to provide an overall creek health score, ranging from Very Poor (<25) to Excellent (40 - 50).

There were no changes to the RARC classification ratings in 2023, which ranged between Average (Loder Creek site BM35 and Wollombi Brook site BM36) and Good (Nine Mile Creek site BM22 and Loder Creek site BM34). The continuity and complexity of the stream health site riparian corridors influence many of the RARC category features. Both river-oak and swamp-oak dominant riparian canopy forming species contribute to the presence of debris (detritus, fallen logs, hollows), which in turn limit the potential complexity of the understorey and groundcover species, including weeds. Additionally, Loder Creek site BM35 banks are relatively steep, containing consolidated soils which are susceptible to erosion and inhibit the establishment of understorey and groundcover vegetation, as indicated by poor category scores returned for ‘Natives’ and ‘Features’ (native species vegetation cover and regeneration of understorey and groundcover communities).

The land surrounding sites BM34 and BM36 is comprised of cleared pasture where livestock have been excluded more recently. Whilst insufficient to change the overall site band rating, recent increases in riparian canopy vegetation width reflect the gradual succession in riparian condition from their agricultural past. Other factors which influence the poor RARC category scores on a site-by-site basis include competition from weed and disturbance from animals (wild pigs) and with ongoing controls in place the

overall riparian and channel condition among Loder Creek and Wollombi Brook sites should continue to improve over time.

7.2.2.8 Aquatic Ecology

Bi-annual Aquatic Ecology monitoring was undertaken in autumn (May-June) and spring (December) 2023. The Aquatic Ecology monitoring included sampling of the aquatic macroinvertebrate fauna using the AusRivAS sampling, sorting and identification protocols, field water quality metering and baited fish trapping. Climatic conditions leading into the 2023 surveys were characterised by intensification of dry weather systems with creek and river flows receding over the course of the year. The lower portion of Nine Mile Creek was dry in spring 2023, and water levels at the southern drainage line site SDL1 had receded to a few very shallow, small pools for both surveys, which were regularly accessed by livestock. A total of 10 sites were sampled in autumn 2023, and eight sites in spring 2023.

Aquatic Habitat Condition

The diversity of aquatic macrophytes among study sites has increased over successive seasonal survey, with 15, 16 and 17 macrophyte taxa recorded in spring 2021, autumn and spring 2022 respectively. For the current survey year there were 17 macrophytes recorded from the 10 sites sampled in autumn and 21 macrophytes recorded from the eight sites in spring 2023, which included two marginal species not recorded from the study area previously (native streaked arrowgrass *Triglochin striata* from LCM2 and the introduced annual beard grass *Polypogon monospeliensis* from Pt11). The distribution of dominant macrophytes within site reaches were for the most part, consistent with that observed in 2022. The submerged macrophytes (sago pondweed *Stuckenia pectinata* and curly pondweed *Potamogeton crispus*) that had disappeared from LCDn in 2022 showed signs of recovery over consecutive surveys in 2023, to form established beds up and downstream of the concrete causeway, as had curly pondweed beds formed considerable beds in isolated backwaters at WBUp. The invasive noxious species *Salvinia molesta* remains restricted in distribution to Wollombi Brook site WBDn and despite the stable, low flow conditions encountered during the latter half of the year, it occurred only in small quantities along isolated pool edges for the spring 2023 survey.

The aquatic habitat availability was also unchanged from former sample occasions. For both 2023 surveys, the southern drainage line site SDL1 contained only very poor aquatic habitats owing to the very small quantities of surface water available to sample, which comprised limited submerged grasses but mostly bare muddy sediments. Similarly, the complexity of aquatic habitats that have been provided by submerged edge bank vegetation and detrital reservoirs at the Wollombi Brook sites has declined as water levels have declined over consecutive surveys. There were no major changes to the relevant Riparian, Channel and Environment inventory (RCE) category scores between the previous spring 2022 survey and 2023 survey results. There were minor improvements to category scores for ‘stream detritus’ at several sites for autumn 2023 and which were sustained for the spring 2023 survey, owing to the accumulation of detrital reservoirs within site channels, and fluctuations in the levels of filamentous green alga between surveys. Both of these temporal changes to aquatic habitats were attributed to the lack of scouring flow events associated with the prevailing dry weather conditions. Overall, the differences in the 2023 RCE results were generally minor (<5%).

Aquatic Ecology Site Water Quality

Surface water quality results were also influenced by weather (and low flow) conditions in 2023, with the drier sites containing surface water in isolated refuge pools subjected to more variable water quality

conditions, however there were no indications of layering between surface and bottom water quality readings for most aquatic ecology sample sites. Whereas water temperatures remained stable for most sites for the autumn survey, surface waters were generally warm in spring, with high temperatures recorded at the Loder Creek sites LCM1 and LCM2 (at 30.7 and 30.0ºC respectively). For the sites with high retention time (sites with little or no flow), dissolved oxygen concentrations can become dominated by in-situ processes including respiration by bacterial communities responsible for decomposition of organic matter (reducing oxygen levels), or production by aquatic primary producers, particularly filamentous green alga. Dissolved oxygen levels were moderate to high for most sites in autumn (60 to 100% saturation), and more variable in spring. In Loder Creek, site pools were supersaturated among the upstream sections where surface flows were reduced to trickles, and concentrations decreased with distance downstream to LCDn (48% saturation). The overall highest water conductivity levels were recorded in Nine Mile Creek and upper Loder Creek catchment sites, with salinity readings decreasing with distance downstream. Conductivity values in Wollombi Brook were variable for each survey, being lower in autumn 2023 and increasing with distance downstream (from 495 to 745 µS/cm), and elevated in spring 2023 at the midstream site WBMd (2326 µS/cm) compared to sites upstream (1130 µS/cm) and downstream (1126 µS/cm). There was orange precipitation emanating from exposed stream bank edges at each of the Wollombi Brook sites in spring 2023 which indicates that contributions from alluvial aquifers during low water level periods may influence localised variability in conductivity levels.

Aquatic Macroinvertebrate Results

There were 56 macroinvertebrate taxa recorded from the ten study area sites in autumn 2023, and 52 taxa recorded from the eight sites sampled in spring 2023, from a total of 77 macroinvertebrate taxa recorded from the study area since the commencement of bi-annual aquatic ecology monitoring in spring 2021. Over the five surveys to date, there have been 35 taxa recorded from the Nine Mile Creek site NMDn (4 samples), 53 taxa recorded from the Loder Creek sites (14 samples) and 63 taxa recorded from Wollombi Brook sites (15 samples). The Wollombi Brook sites continue to record higher and more temporally stable macroinvertebrate indices, as shown by the macroinvertebrate diversity (richness), SIGNAL-2 pollution tolerance index and the diversity of sensitive EPT macroinvertebrate taxa results in autumn and spring 2023.

Improvements in the macroinvertebrate indices results at Loder Creek downstream site LCDn are commensurate with improvements to the aquatic habitat availability noted over recent seasons. Compared to the range of results recorded among Loder Creek sites, Nine Mile Creek site NMDn recorded has recorded similar macroinvertebrate indices results on a survey-to-survey basis, with a gradual improvement coinciding with sustained wet conditions from spring 2021 to spring 2022, and stability in autumn 2023 before drying up. For both 2023 surveys the southern drainage line site SDL1 contained only two to four very small remnant pools within the site length, and it is likely that the site channel had dried up completely between autumn and spring, with the small pools encountered in spring 2023 likely formed from rainfall runoff over the weeks prior to the commencement of sampling. Site SDL1 has in the past supported diverse macroinvertebrate communities (25 to 26 taxa for each of the spring 2021, autumn and spring 2022 surveys), however for the autumn and spring 2023 surveys there were only six and 13 taxa recorded (respectively), with an accompanying SIGNAL-2 value of 2.00 and 2.58. It is recommended that the autumn and spring 2023 data be excluded from site future site summary statistics as the water quality was impacted by livestock and therefore does not provide an accurate representation of the potential aquatic habitats or catchment runoff water quality from upstream sources.

Fish Sample Results

To date there have been nine confirmed species of fish recorded from the BCC aquatic ecology monitoring sites. The persistent wet conditions encountered during recent seasonal surveys would have facilitated fish passage, and therefore distribution of species among ephemeral drainages throughout the study sites (Loder Creek to Nine Mile Creek, the southern and northern drainage lines), however drier conditions experienced in 2023 would likely have restricted fish movements among refuge pools within creek sections. The invasive pest species plague minnow remains the most successful species being recorded from 91% of samples, in all creek sections on each survey occasion. The Loder Creek catchment sites and Wollombi Brook sites continue to provide suitable habitat for native fish species including mullet, empire gudgeons, firetail gudgeons and flathead gudgeons, and Australian smelt and carp were restricted to Wollombi Brook in 2023. Another invasive species, goldfish, were recorded for the first time from then study area; from the northern drainage line site NDL1 in autumn 2023 prior to drying.

7.2.3 Comparison Against Predictions

A Surface Water Assessment was undertaken by Umwelt (2013) as part of the Bulga Optimisation Project EIS. The assessment concluded that with the implementation of the water management system and the proposed controls there was only a low risk of impacting on the water quality of the downstream watercourses, and that results would be comparable to background levels. A comparison of the background water quality against the 2023 data has been made in **Table 7.4**. *The Annual Surface and Groundwater Assessment* (Jacobs, 2024) (refer to **Appendix D**) reviews groundwater performance against criteria.

Table 7.4 Comparison of Surface Water Monitoring Results (2023) against Background (2013 Bulga Optimisation Project EIS)

Sample Point	pH		EC (µS/cm)		TSS (mg/L)	
	2023 Range	EIS Range	2023 Average	EIS Range	2023 Average	EIS Range
LR1	6.9–7.6	6.6–8.8	633	4–9,470	8	1–72
LR2	7.7–8.2	6.3–8.8	5,185	130–6,230	13	3–440
LR5	7.3–8.0	6.7–8.4	1,130	196–3,470	9	2–144
W2	7.3–7.8	6.6–8.2	880	195–1,470	8	1–114
W4	7.2–8.6	6.5–8.2	840	200–1,760	7	2–42

7.2.4 Long Term Trend Analysis

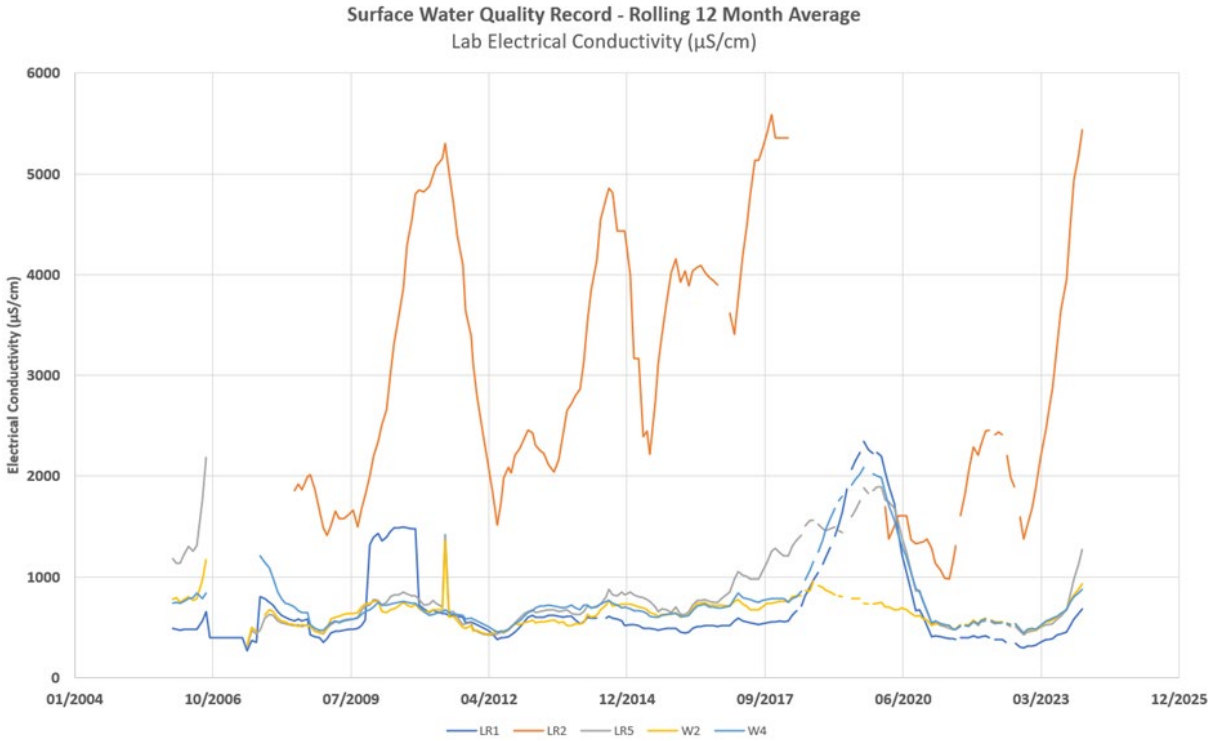


Figure 7.3 Long Term Surface Water EC Results

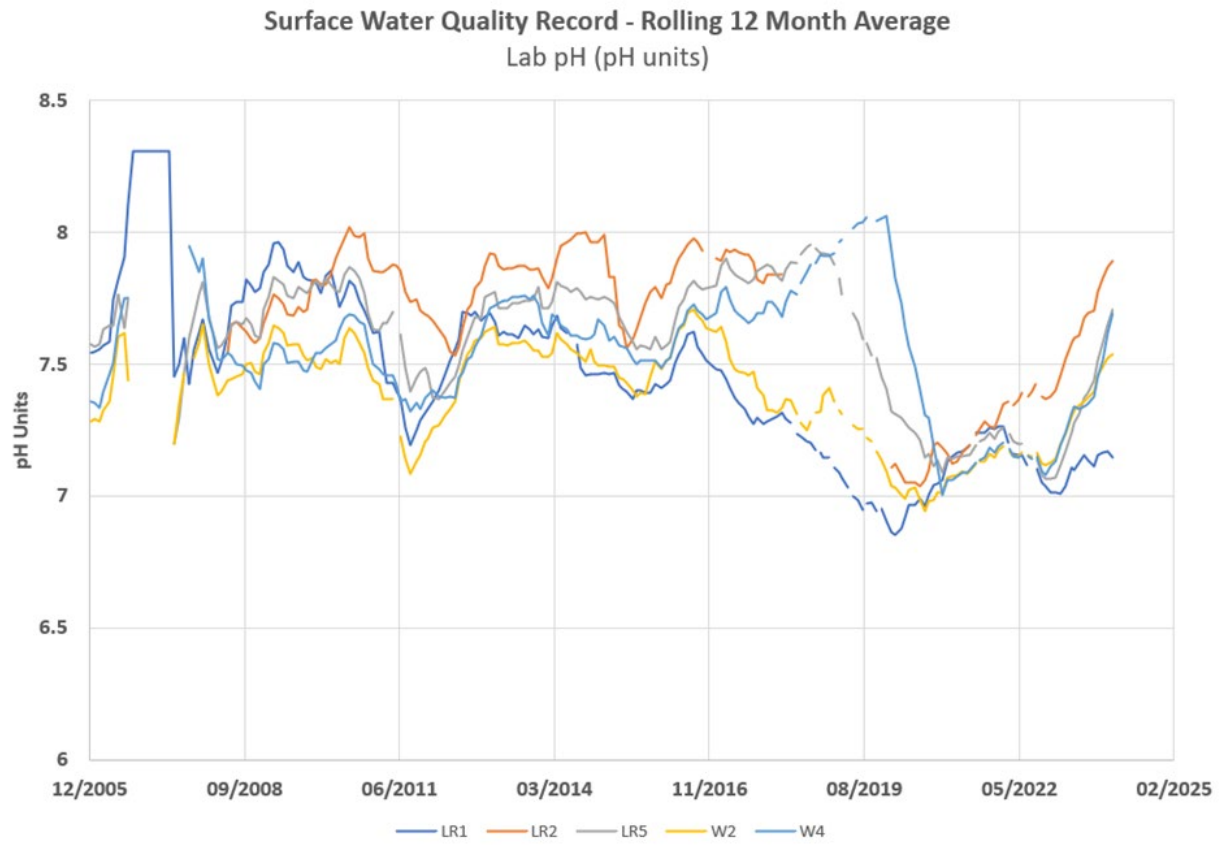


Figure 7.4 Long Term Surface Water pH Results

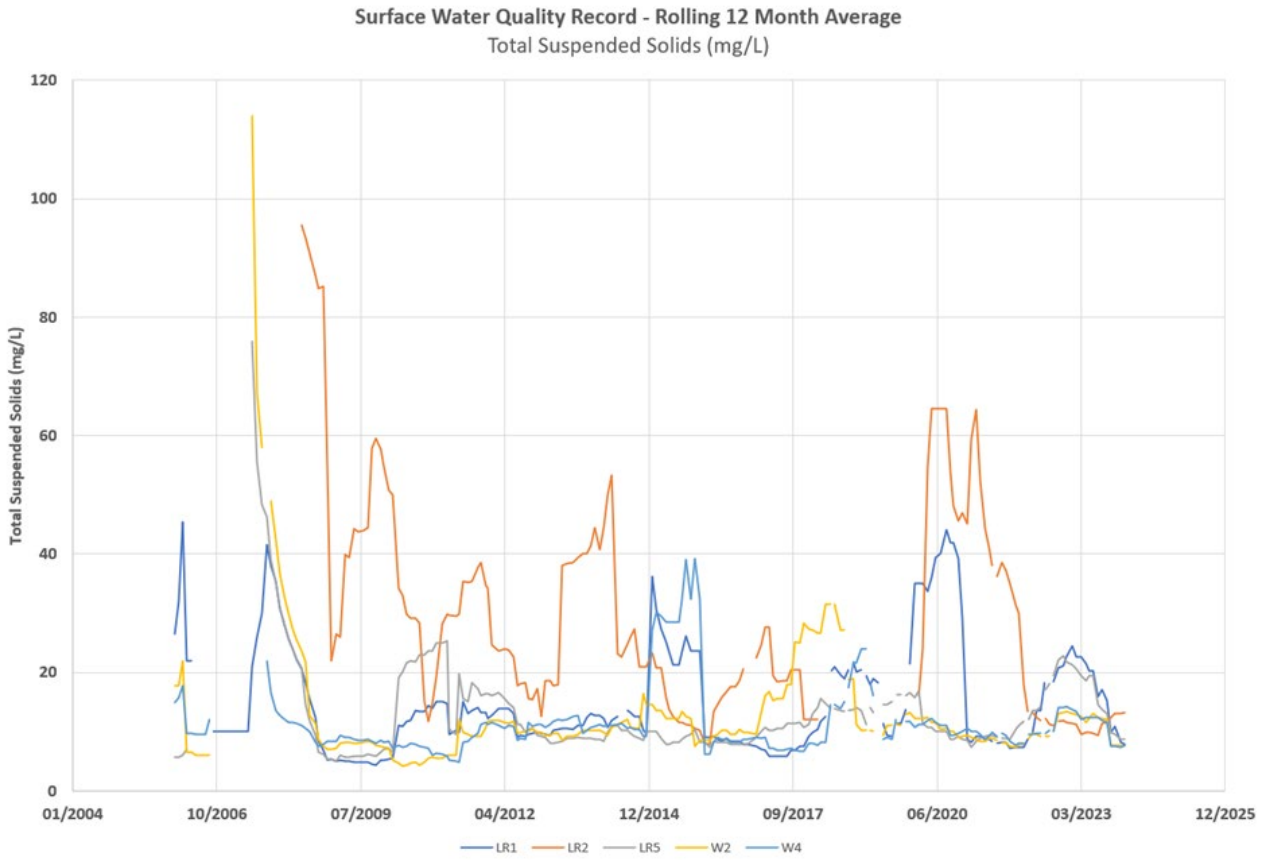


Figure 7.5 Long Term Surface Water TSS Results

7.3 Erosion and Sedimentation

7.3.1 Environmental Management

A variety of controls are implemented at Bulga Coal to mitigate operational risks associated with erosion and sedimentation. During and following ground disturbance, structures such as sediment ponds, sediment fences, spoon drains, sediment catches and site catch sumps are used where appropriate to manage runoff and minimise erosion and sedimentation. Inspections are undertaken following more than 20 mm of rain in 24-hours to evaluate the effectiveness of erosion and sediment control structures and any maintenance or dewatering requirements. Additional stabilisation works for these areas may include reshaping, amelioration of dispersive soil, revegetation, fencing and weed control.

High risk sediment dams have been incorporated into an automatic management system which continuously monitors dam water levels and commences dewatering when the water level reaches set trigger levels. Other sediment dams are monitored weekly and following rainfall events to determine pumping requirements.

Monitoring and inspections at Bulga Coal are completed in accordance with the *Bulga Coal Erosion and Sediment Control Plan* approved in 2021. This monitoring system is designed to comply with EPL 563 and the erosion and sediment control conditions stipulated within the Bulga Underground Operations and Bulga Open Cut Development Consents.

7.3.2 Environmental Performance

There were no erosion and sediment related incidents recorded at Bulga Coal during the reporting period.

7.4 Groundwater

7.4.1 Environmental Management

Groundwater is managed in accordance with the approved WMP.

Mapping of the deep and shallow depressurisation of the hard rock (coal measures) strata is undertaken. This identifies the potential for any adverse impacts on the shallow alluvial aquifer systems associated with Wollombi Brook and Monkey Place Creek. Depressurisation is predicted within the coal measures on a regional scale; however, it is not expected to produce any measurable impact in the overlying alluvial aquifer.

The monitoring program provides early warning for potential changes in groundwater levels and quality.

Bulga has a comprehensive groundwater monitoring network within and outside of the mine footprint area with groundwater monitoring points shown in **Figure 6.3**. The monitoring network comprises both standpipe piezometers and multilevel vibrating wire piezometers installed in all hydrostratigraphic units.

As part of the EPBC Act approval EPBC 2018/8300 (as varied on the 9 September 2021), an ecohydrological conceptual model was submitted to the Commonwealth Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW) 20 December 2021, currently pending approval.

7.4.2 Environmental Performance

A summary of groundwater monitoring results and relevant criteria from the WMP is provided in **Table 7.6**, with detailed groundwater monitoring results available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/reporting-documents).

Table 7.5 Summary of Groundwater Monitoring Results – 2023 Annual Averages

Piezometer	Water Elevation (mAHD)	Water Level (mAHD)	Lab pH	Lab pH		Lab EC (µS/cm)	Lab EC (µS/cm)
				20th Percentile Trigger Value	80th Percentile Trigger Value		80TH Percentile Trigger Value
Broke Area Alluvials							
GW1	90.39	**84.37**	7.4	**6.7**	**7.3**	1,258	**3,634**
GW2	84.89	**NA[1]**	7.2	**NA[1]**	**NA[1]**	4,700	**NA[1]**
GW3	76.66	**74.48**	7.7	**6.7**	**7.2**	1,640	**6,010**
GW4	79.38	**NA[1]**	7.3	**NA[1]**	**NA[1]**	1,914	**NA[1]**
GW5	80.99	**NA[1]**	7.1	**NA[1]**	**NA[1]**	2062.5	**NA[1]**
GW6	74.99	**72.21**	7.6	**7.3**	**7.8**	2,249	**7,900**
GW7	74.32	**63.21**	7.1	**6.7**	**7.4**	4,033	**3,946**
GW8	72.54	**66.86**	7.4	**6.6**	**7**	888	**5,936**
GW9	72.55	**70.83**	7.0	**6.7**	**7.2**	4,353	**4,458**
GW10	72.62	**69.76**	7.3	**7.1**	**7.6**	6,160	**10,252**
V3	70.87	**65.49**	7.1	**7.1**	**7.6**	1,552	**1,744**
Broke Area Wollombi Seam							
P2	69.18	**67.1**	6.9	**7.4**	**8**	402	**12,834**
P5A	69.92	**67.84**	6.6	**7.5**	**8.2**	148	**6,242**
P6A	68.59	**63.4**	7.0	**7**	**8.1**	1,523	**2,740**
Northern Area Shallow Alluvials							
F1	66.73	**61.26**	7.4	**7.2**	**7.6**	1,150	**1,025**
F2	66.42	**63.3**	7.3	**7.1**	**7.4**	1548	**1,720**
V1	65.95	**63.14**	7.3	**7.3**	**7.7**	952	**1,570**
V2	60.97	**58.56**	6.8	**6.4**	**7.1**	127	**922**

Piezometer	Water Elevation (mAHD)	Water Level (mAHD)	Lab pH	Lab pH		Lab EC (µS/cm)	Lab EC (µS/cm)
				20th Percentile Trigger Value	80th Percentile Trigger Value		80TH Percentile Trigger Value
WBR50A	59.77	**56.98**	7.6	**7.1**	**7.7**	2804	**14,000**
SBC/Broke Area Lower Whybrow Seam							
P6B	-24.65	**-24.84**	9.0	**6.7**	**7.3**	7,092	**1,353**
P8	76.96	**63.3**	6.5	**7.3**	**9.3**	247	**5,076**
Northern Area Lower Whybrow Seam							
WBR50	28.66	**24.3**	6.5	**6.7**	**8**	199	**8,382**
Northern Alcheringa Seam							
WBD62A	71.46	**NA[1]**	7.2	**NA[1]**	**NA[1]**	477	**NA[1]**
Beltana Area Miscellaneous Bores and Wells							
WBR15	69.76	**59.32**	7.6	**6.8**	**7.3**	908	**924**
Dwyers	65.27	**60.9**	7.9	**7.3**	**7.6**	1573	**1,476**
Fernance	66.77	**59.74**	7.7	**7.3**	**8**	1423	**1,473**
McG1	93.80	**89.86**	8.0	**7.5**	**8**	736	**918**
White 1	67.41	**63.36**	7.8	**7**	**7.4**	861	**2,444**
Beltana Area NPZ							
NPZ3-A	-[2]	**56.01**	-[2]	**6.5**	**8.1**	-[2]	**1,362**
NPZ3-B	69.98	**59.63**	7.8	**7.3**	**7.5**	805	**921**
NPZ4-A	70.91	**56.01**	7.3	**6.9**	**7.3**	705	**729**
NPZ4-B	58.78	**45.32**	7.2	**7.3**	**7.8**	1383	**1,342**
NPZ5-A	67.62	**60.9**	6.8	**6.9**	**7.3**	806	**886**
NPZ5-B	53.03	**41.16**	7.4	**7.1**	**7.6**	2687	**2,760**
NPZ7-1	67.39	**53.47**	7.8	**6.7**	**7.7**	1235	**1,240**

Piezometer	Water Elevation (mAHD)	Water Level (mAHD)	Lab pH	Lab pH		Lab EC (µS/cm)	Lab EC (µS/cm)
				20th Percentile Trigger Value	80th Percentile Trigger Value		80TH Percentile Trigger Value
NP27-2A	67.46	**62.04**	7.6	**7.1**	**7.6**	1760	**2,250**
NPZ7-2B	66.74	**45.36**	8.1	**6.8**	**7.8**	1278	**1,307**
NPZ7-3A	68.17	**62**	8.3	**7**	**7.5**	1362	**2,540**
NPZ7-3B	69.38	**53.7**	8.1	**7.4**	**7.8**	1250	**1,316**
Wollombi Alluvials and Shallow Coal Measures1							
SBD196	69.31	**NA[1]**	6.9	**NA[1]**	**NA[1]**	501	**NA[1]**
WBD160	67.76	**63.83**	6.9	**6.9**	**7.3**	277	**1,310**
WBR180	36.38	**34.3**	7.3	**7.1**	**7.5**	20667	**20,850**
WBR181	61.20	**59.41**	7.3	**7.2**	**7.5**	3673	**2,670**
WBR182	64.22	**61.7**	7.3	**7.3**	**8.3**	1578	**1,512**
WBR183	63.94	**NA[1]**	7.2	**7.0**	**7.4**	3602	**3,484**
WBR240	61.11	**58.36**	7.5	**7**	**7.5**	15567	**26,800**
WBR241	61.03	**59.63**	6.7	**6.4**	**6.9**	282	**435**
Loders Creek Alluvials							
LC1	52.96	**NA[1]**	Dry[2]	**NA[1]**	**NA[1]**	Dry[2]	**NA[1]**
LC2	43.01	**NA[1]**	7.7	**NA[1]**	**NA[1]**	2,862	**NA[1]**
Northern Tailings emplacement facility piezometers3							
MB1a	65.06	**NA[1]**	-[3]	**NA[1]**	**NA[1]**	-[3]	**NA[1]**
MB1b	-28.09	**NA[1]**	-[3]	**NA[1]**	**NA[1]**	-[3]	**NA[1]**
MB2	66.51	**NA[1]**	-[3]	**NA[1]**	**NA[1]**	-[3]	**NA[1]**
MB3a	53.75	**NA[1]**	-[3]	**NA[1]**	**NA[1]**	-[3]	**NA[1]**
MB3b	-10.98	**NA[1]**	-[3]	**NA[1]**	**NA[1]**	-[3]	**NA[1]**

Piezometer	Water Elevation (mAHD)	Water Level (mAHD)	Lab pH	Lab pH		Lab EC (µS/cm)	Lab EC (µS/cm)
				20th Percentile Trigger Value	80th Percentile Trigger Value		80TH Percentile Trigger Value
Warkworth Sands monitoring bores							
WWS1	93.97	**NA[1]**	Dry[2]	**NA[1]**	**NA[1]**	Dry[2]	**NA[1]**
WWS2a	Dry	**NA[1]**	Dry[2]	**NA[1]**	**NA[1]**	Dry[2]	**NA[1]**
WWS2b	94.03	**NA[1]**	198	**NA[1]**	**NA[1]**	198	**NA[1]**
WWS3a	Dry	**NA[1]**	Dry[2]	**NA[1]**	**NA[1]**	Dry[2]	**NA[1]**
WWS3b	Dry	**NA[1]**	Dry[2]	**NA[1]**	**NA[1]**	Dry[2]	**NA[1]**

[1] No trigger values have been established.

[2] No results available for 2023. LC1 was dry or with not enough water to sample. NPZ3-A no longer monitored since 2015.

[3] The Northern Tailings emplacement facility piezometers sites are grouted live wire piezometers and do not have access to water quality.

Jacobs have produced the 2023 *Bulga Coal Complex Annual Surface and Groundwater Monitoring Report* (Jacob, 2024) which is attached as **Appendix D.** The following is a summary of the groundwater monitoring review.

The 2023 reporting period recorded 524 mm of rain with April to September period recording 107 mm lower than the long term average of 259 mm for this period. The surface and groundwater monitoring data reflects the natural response to a dry year after two years of greater than average rainfall.

The groundwater monitoring network covers the area along the Wollombi Brook and Monkey Place Creek to the west and south and extends 5 km to the north and northwest of the Blakefield South footprint. The current groundwater monitoring network is comprehensive and includes 50 monitoring locations in the alluvium, overburden strata (sandstone and coal seams), Whybrow Seam, Blakefield Seam and underlying and overlying strata.

Overburden pressures in the top 50 m to 100 m from surface have recorded generally decreasing groundwater levels in 2023 which is likely related to the lower-than-average rainfall for the year. Despite groundwater levels falling across the reporting period, there is a continuing recovery trend in groundwater levels following the cessation of extraction at Blakefield South in 2018.

Groundwater levels in SBD196 (Blakefield Seam) have returned to 2015 - 2016 pressures. Re-pressurisation in the Alcheringa Seam is observed in hydrographs from a number of bores monitoring the seam. Groundwater levels in most monitoring bores targeting the Alcheringa Seam remain significantly above 2004 – 2016 levels. The majority of recovery in the seam has occurred since the start of 2020 and is related to the cessation of extraction in 2018 and prevailing climatic conditions since 2020.

Shallow groundwater levels in the alluvium (Wollombi Creek and Monkey Place Creek) decreased over the period. However, groundwater levels in the alluvium generally remain above those recorded before the 2016 - 2019 drought. Rainfall continues to be the major influence on alluvium groundwater levels with no apparent influence from mining operations.

Groundwater quality (EC and pH) trigger values were exceeded for several monitoring bores over the monitoring period. While the trigger values are not assessment criteria, exceedances are used to initiate investigations into groundwater quality. Groundwater pH exceedances were within ranges of natural variation, and do not show impacts attributable to Bulga Coal over the period.

The major ion chemistry for groundwater samples collected in December 2023 are similar to major ion chemistry from December in previous years, with shifts highlighting the drier conditions in 2023. The alluvium and sandstone water samples typically plot as different water types, with some minor overlap, indicating different recharge mechanisms and residence times. The water type interpretation indicates that the alluvium and coal seam water samples may predominantly receive recharge directly or indirectly from rainfall and/or have shorter transmission times from the recharge point.

7.4.3 Comparison Against Predictions

Two successive years (2021 and 2022) of above average rainfall and flooding have resulted in substantial volumes of rainfall runoff reporting to the open cut (approximately 13.5 GL) and increased groundwater recharge; during 2023 rainfall recorded was below average, which resulted in approximately 3.7 GL of rainfall runoff reporting to the open cut.

Both the alluvial and Permian aquifers continued recovering through 2022; and saw a slight reduction during 2023, due to lower rainfall.

7.4.4 Long Term Trend Analysis

Bulga Coal has an extensive groundwater monitoring network which covers Wollombi Brook and Monkey Place Creek alluvium, overburden, sandstone, and deep coal seam hydrostratigraphic units. A long-term monitoring record (over 20 years) now exists and it enables interpretation of groundwater trends.

The groundwater levels in the Wollombi Brook and Monkey Place Creek alluvium continue to fluctuate in response to rainfall events clearly evident in 2022 and lower than average years like 2023. Overall, there does not appear to be any measurable impact from mining operations on the alluvial aquifers (Jacobs, 2024). Detailed groundwater monitoring trend graphs are presented in (Jacobs, 2024) which is attached as **Appendix D.**

8.0 Rehabilitation

Progressive rehabilitation of disturbed areas is an important aspect of the mining operations at Bulga Coal. The objective of rehabilitation is to restore the land to a condition that is equal or greater than that prior to disturbance. Ongoing rehabilitation of areas disturbed by operations has continued throughout the reporting period. Annual rehabilitation inspections and scientific plot-based monitoring is undertaken by experienced rehabilitation consultants to monitor the success of rehabilitation works.

8.1 Post Mining Land Use

In accordance with SSD-4960 and the *Biodiversity Management Plan*, rehabilitation has continued to focus on the goal of establishing EECs.

The post-mining land use goal is the combination of objectives contained in the Bulga Optimisation Project approval (for the Bulga Open Cut), the Bulga Underground Operations 2003 EIS and *Bulga Optimisation Project Modification 3 and Bulga Underground Modification 7 – Statement of Environmental Effects* (Umwelt, 2019). Following closure of Bulga Coal and the subsequent rehabilitation activities, that the areas disturbed by mining activities will be predominantly native vegetation (woodlands on spoil dumps and riparian communities along established drainage lines) with a minimum of 260 ha being returned to land suitable for agricultural uses. In summary, the land associated with Bulga Underground Operations to the east of Charlton Road is either contained within the footprint of the Bulga Open Cut final land use or is regenerating woodland above underground workings; whilst the land to the west of Charlton Road is principally agricultural land used for grazing, viticulture or olive groves. Apart from an ecological and archaeological conservation area in the north-west of the colliery holding, the goal is to retain the agricultural productivity of the land to the west of Charlton Road and above the underground mine.

The areas disturbed by mining will be predominantly returned to land and soil capability Classes 6 and 7. Existing areas currently mapped as being land and soil capability Class 3 and Class 4 will remain generally consistent post-closure, with a small reduction in Class 5 areas expected. Based upon current approvals, mining operations at Bulga Coal will cease mining in 2039.

The Final Landform and Rehabilitation Plan depicting the post-mining land use outlined within this section was approved by the Resources Regulator on 18 October 2023.

8.2 Rehabilitation Performance During the Reporting Period

8.2.1 Rehabilitation Summary

Rehabilitation activities have been completed in accordance with the approved Forward Work Program and *Bulga Coal Rehabilitation Management Plan* (RMP). Rehabilitation activities undertaken in 2023 included:

- shaping of overburden dumps
- removal of decommissioned infrastructure (where required)
- installation of geomorphic drainage structures

- deep ripping
- rock raking
- installation of habitat features (e.g. stag trees, woody debris, rock piles)
- spreading of topsoil/suitable growth medium
- application of ameliorants
- re-ripping of prepared surface
- seeding with target ecological communities.

Further details on these steps are provided in the RMP which is available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/management-plans). A summary of rehabilitation at Bulga Coal as at the end of 2023 is presented in **Table 8.1**.

Table 8.1 Rehabilitation Status at Bulga Coal

Mine Area Type	Previous Reporting Period (Actual) 2022	This Reporting Period (Actual) 2023	Next Reporting Period (Forecast) 2024
Total mine footprint	3,481.73	3,497.97	3,503.1
Total active disturbance	2,357.83	2,432.48	2,405.84
Land being prepared for rehabilitation	15.83	0	31.77
Land under active rehabilitation	1,108.08	1,065.48	1,097.26
Completed rehabilitation*	0	0	0

* Denotes land that has been signed off by RR as completed rehabilitation.
Note: 2022 values align with the submitted 2022 Annual Rehabilitation Report.

8.2.2 2023 Rehabilitation – Bulga Open Cut

During 2023, Bulga Coal completed 38.6 ha of rehabilitation, including 15.36 ha at the East Pit Emplacement Area and 23.24 ha at the Eastern Emplacement Area, with maintenance of previously established rehabilitation also occurring throughout the year. The rehabilitation establishment methodology is outlined in the RMP.

8.2.2.1 Landform Details

During 2023, Bulga Open Cut continued to implement a geomorphic natural landform design, as shown in **Photo 8.1**. Shaping of overburden dumps occurred on both the Eastern Emplacement Area and the East Pit Dumps. Bulga Open Cut continued to progressively rehabilitate all available overburden emplacement areas which have reached final landform extents.

Photo 8.1 Rehabilitation completed in 2023 at the Eastern Emplacement Area

8.2.2.2 Topsoil

Stockpiled topsoil was spread at a nominal thickness of 100 mm on the shaped landform. Topsoil was sourced directly from topsoil stripping activities and topsoil stockpiles stored onsite. Gypsum was applied immediately after at a rate of 8 t/ha and then deep ripped to a depth of 450 mm to incorporate the topsoil into overburden material to create a suitable seed bed, as shown in **Photo 8.2** and **Photo 8.3**.

Photo 8.2 Deep ripping of topsoil in progress at the East Pit Emplacement in 2023

Photo 8.3 Topsoil applied and ripped on the Eastern Emplacement Area in 2023

8.2.2.3 Physical and Chemical Characteristics

Bulga Open Cut has identified some coal seams and interburdens which are potentially acid forming and contain elevated sulfur levels and or contain carbonaceous materials. These seams and interburdens have been analysed and are separated and handled/dumped to reduce the long-term potential to form acids and or generate heating. Further detail on this material and its management is provided in the RMP.

8.2.2.4 Vegetation Species

Revegetation activities in 2023 focused on the establishment of the Central Hunter Grey Box – Ironbark Woodland EEC. The seed mix for these areas included the key canopy, understory and groundcover species for the community (as outlined in the RMP and *Biodiversity Management Plan*). Outcomes from the Hunter Ironbark Research Program were used to guide the species selected to establish the target ecological communities.

8.2.2.5 Habitat Resources and Potential

The *Biodiversity Management Plan* outlines the requirement for incorporating habitat features into rehabilitated landscapes. In 2023 several methods were used to increase the habitat potential of rehabilitated areas, including the incorporation of:

- woody debris
- drains and water structures
- rock piles
- stag trees.

As rehabilitation matures, other habitat enhancement methods such as installing nest boxes will be utilised.

8.2.2.6 Temporary Rehabilitation and Visual Mitigation

No temporary rehabilitation was carried out during 2023.

8.2.2.7 Rehabilitation Maintenance

Rehabilitated areas at Bulga Open Cut are subject to an ongoing monitoring and maintenance program to ensure that rehabilitation objectives and completion criteria are achieved or are on trajectory to be achieved. Inspections are conducted annually by an external consulting rehabilitation specialist. A summary of care and maintenance activities undertaken during 2023 is provided in the following sections and in **Table 8.2**.

Table 8.2 Maintenance Activities on Rehabilitated Land for Bulga Open Cut

Nature of Treatment	Area Treated (ha)		Comment/control Strategies/Treatment Details
	2023 (actual)	2024 (planned)	
Additional erosion control works (drains, recontouring, rock protection, erosion repairs)	<1	<1	A landform stability inspection has been conducted annually by an engineering consultant since 2021 to identify all erosion features across rehabilitated areas. During 2023 repairs were undertaken on localised erosion features identified across the Noise and Visual Bund, Northern 'Blakefield' emplacement area and the southern section of the Eastern Emplacement Area. In 2024 a follow up landform stability inspection will be undertaken with continued erosion remediation works undertaken on rehabilitation areas, as required.
Re-seeding/replanting (species density, season etc.)	3.8	1.4	Bare areas lacking vegetation growth or topsoil cover will be remediated in 2024.
Adversely affected by weeds (type and treatment)	~40	~144	Weed control works in 2023 were carried out across the Eastern Emplacement and Noise and Visual Bund rehabilitation areas. Weed control works will continue in 2024 with new rehabilitation areas being added to the program as they are completed. The main weeds being controlled are Lantana, Galenia, Blue Heliotrope, Acacia Saligna and various exotic grass species.
Feral animal control (additional fencing, trapping, baiting etc.)	N/A	N/A	Feral animal control will concentrate on wild dog, kangaroo and pig control within rehabilitation areas as required

8.2.3 2023 Rehabilitation – Bulga Underground Operations

No rehabilitation of Bulga Underground Operations infrastructure was undertaken during 2023, however work continued on decommissioning redundant infrastructure to allow for the progression of open cut mining as described in **Section 4.4.4.**

8.2.3.1 Rehabilitation Maintenance

Rehabilitated areas at Bulga Underground Operations are subject to an ongoing monitoring and maintenance program to ensure that the rehabilitation objectives and completion criteria are achieved or on trajectory to be achieved. A summary of rehabilitation maintenance activities undertaken during 2023 are outlined in **Table 8.3**.

Table 8.3 Maintenance Activities on Rehabilitated Land for Bulga Underground Operations

Nature of Treatment	Area Treated (ha)		Comment/control Strategies/Treatment Details
	2023 (actual)	2024(planned)	
Additional erosion control works (drains re contouring, rock protection)	0	As required	Maintaining temporary controls around active rehabilitation areas as identified in routine and scheduled inspections.
Subsidence Repairs	As required	As required	Subsidence inspections are undertaken on an annual basis or after high rainfall events. Repairs are undertaken on an as needs basis as described in **Section 6.5**.
Soil treatment (fertiliser, lime, gypsum etc.)	0	0	Ameliorants applied to rehabilitation areas as required.
Re-seeding/replanting (species density, season etc.)	0	0	Supplementary seeding of rehabilitation maintenance and repairs identified in annual rehabilitation inspection.
Adversely affected by weeds (type and treatment)	As required	As required	Weed management activities were ongoing in 2023 and focused mainly on the Vere and Underground rehabilitation areas. Target areas identified during monthly inspections, annual rehabilitation inspections and buffer land inspections.
Feral animal control (additional fencing, trapping, baiting etc.)	N/A	N/A	Feral animal control concentrating on wild dog, kangaroo and pig control, as required.

8.3 Decommissioning of Infrastructure

There was no decommissioning of infrastructure in 2023 that required rehabilitation. Refer to **Section 4.4.4** for a summary of other demolition and decommissioning of infrastructure that occurred in 2023.

8.4 Department of Regional NSW – RR Rehabilitation Sign-off

In 2023, no areas of rehabilitation received formal sign-off from RR that land use objectives and completion criteria had been met.

8.5 Variations from Proposed Forward Work Program Activities

Table 8.4 summarises the rehabilitation progress at Bulga Coal (including Bulga Open Cut and Bulga Underground Operations) during 2023 against the Forward Work Program (FWP) forecast.

A copy of the 2023 Annual Rehabilitation Report and 2024 FWP is provided on the Bulga website.

Table 8.4 Bulga Coal Rehabilitation Performance against Forecast

Mine Area Type	2023 Actual Data	2023 FWP Forecast	2024 FWP Forecast
Rehabilitation (ha)	38.58	38.51	31.77
Disturbance (ha)	16.16	18.82	5.13
Rehabilitation Re-disturbance (ha)	97.76	66.5	80.47

Rehabilitation in 2023 was as per the approved FWP forecast. An additional 31.26 ha of historic rehabilitation was re-disturbed in 2023 to allow for overburden emplacement. A variation to the 2023 FWP was submitted to the NSW RR. The amendment was refused by the RR due to an amendment not being required. Bulga was advised that the variation to areas can be reported in the 2023 Annual Review.

8.6 Rehabilitation Monitoring, Trials and Research

Bulga Coal has an extensive rehabilitation monitoring program to track the establishment and progress of rehabilitated areas towards the completion criteria. The objectives of the rehabilitation monitoring program are to:

- assess the long-term stability and functioning of re-established ecosystems on mine affected land
- assess rehabilitation performance against the completion criteria
- facilitate continuous improvement in rehabilitation practices.

The monitoring program will continue within rehabilitated and non-mined areas (reference sites) until it can be demonstrated that rehabilitation has satisfied the closure criteria. The rehabilitation monitoring criteria for each domain have been developed to demonstrate that selected indicators (or criteria) have reached their established completion criteria or that a satisfactory successional trajectory has been established that will result in a self-sustainable ecosystem.

Based on the outcomes of the rehabilitation monitoring program, a care and maintenance program is implemented. The scope of the care and maintenance program may include weed and feral animal control, fertilising, re-seeding or planting (where required), and erosion and sediment control works.

8.6.1 Annual Rehabilitation Monitoring Program

The annual rehabilitation monitoring program includes Initial Establishment Monitoring (IEM) and Long-Term Monitoring (LTM). In summary, the IEM is a rapid style assessment of young (≤3 years old) rehabilitated areas, principally to determine germination success, landform stability and other management issues such as establishment of weeds. The LTM procedure is applied to rehabilitation that is a minimum of four years since establishment. The objective of the LTM program (areas >3 years old) is to evaluate progress of rehabilitation towards fulfilling completion criteria, including additional statutory requirements that may apply to the operation and ultimately the targeted post-mining land use.

The methods described for LTM apply to both rehabilitation and reference monitoring sites. For further details on methodology and timing refer to the *GCAA Completion Criteria and Rehabilitation Monitoring Procedure*.

8.6.1.1 General Observations

A total of 21 rehabilitation blocks and 54 transects/plots were assessed across the Noise and Visual Bund (NVB), Eastern Emplacement Area (EEA) and the underground mining area; including eight blocks monitored for IEM, twelve blocks monitored for LTM and one block of temporary rehabilitation. All rehabilitation blocks assessed (except temporary rehabilitation) were being returned to a native woodland/forest land use, and covered a cumulative area of approximately 390.1 ha.

Ecological monitoring included the assessment of four of the seven permanent monitoring plots established in areas of remnant native vegetation within the buffer zones surrounding Bulga Coal. This monitoring is implemented to identify potential deterioration (or lack thereof) in vegetation health or habitat quality as a result of mining operations.

Field surveys were undertaken during May 2023, and followed three years of good local weather conditions and above-average rainfall.

Based on collected monitoring results and observations, management recommendations have been suggested to improve the condition of rehabilitation areas and ensure they are on a trajectory towards the approved rehabilitation objectives.

Temporary Rehabilitation Summary Findings

Areas of temporary rehabilitation are inspected solely to demonstrate adequate stability and vegetative cover. The one block assessed in 2023 showed moderate to sparse vegetative cover yet generally satisfactory landform stability across most of the block. Some areas of localised gully erosion were noted, however as all surface drainage was contained internally within the boundaries of the block, no off-site discharge of sediments occurred. The entire area is planned to be dumped over and permanently rehabilitated during 2025, therefore remediation of existing erosion gullies has been deemed unnecessary.

Rehabilitation IEM Blocks Summary Findings

Surface drainage was assessed as satisfactory across all 2023 IEM blocks, with no issues of ponding or settlement detected that could threaten to cause rehabilitation failure.

Four of the eight IEM blocks were identified as requiring further erosion repair works to remediate gully channels of moderate to high severity.

Groundcover protection was excellent at most IEM blocks and on average comprised between ~80.1% at the time of the 2023 monitoring, i.e. well-exceeding the 70% minimum target benchmark.

A high total of 104 native species were recorded across all IEM blocks in 2023, whilst average native richness was variable between the blocks and ranged from a moderate ~23.7 species/site to a very high ~42.8 species/site. Native species assemblages were excellent in all blocks, with on average more than 90.0% of the total native richness comprised of species representative of the target communities.

Average tree stem densities were highly variable and ranged from a low 175 stems/ha to an extremely high 3,075 stems/ha. Two blocks displayed tree densities well short of indicative targets and will need assisted

plantings if further seed germination does not occur. Conversely two blocks displayed excessive tree densities which may hamper the development of adequate community structure over time if not reduced. Tree thinning is however not recommended for immediate implementation as high tree densities in areas of young rehabilitation can initially provide benefits in terms of soil stabilisation and suppression of weeds.

Average cumulative priority weed cover was variable but on average within allowable levels in all but one IEM blocks at the time of monitoring. The latter was a block of 2021 rehabilitation on the Noise and Visual Bund where the establishing ground layer was largely comprised of the invasive grasses South-African Pigeon Grass and Kikuyu. Invasive perennial grasses are widespread and a common issue across much the Noise and Visual Bund, and will require significant management inputs and long timeframes to successfully manage.

In addition, four of the five blocks reporting low weed levels at the time of monitoring (all blocks in the Eastern Emplacement Area and one block in the Noise and Visual Bund) were affected by widespread infestations of Lantana emerging from topsoil-borne seeds, which could rapidly become problematic if left untreated. Control of the species has been ongoing across the Eastern Emplacement Area in the past year (with locally positive outcomes), and will need to be sustained until the seedbank is depleted and population levels reach acceptably low levels.

Rehabilitation LTM Blocks Summary Findings

Landforms, soil profiles and vegetation were generally well-established across all LTM blocks monitored in 2023, with very limited active erosion processes recorded across the slopes. However, localised erosion / scours in water management structures (contour banks and drains) were identified in five of the LTM blocks which will need to be remediated.

Surface drainage was satisfactory across all LTM blocks located on overburden emplacement areas, with no issues and ponding or settlement detected that could threaten to cause rehabilitation failure.

A total of 143 native species were recorded across all LTM blocks in 2023, whilst average native species richness was variable between the blocks and ranged from a very low ~13.0 species per site to a very high ~51.0 species per site. Average total native species richness was greater than 50% of the average native richness at the corresponding reference sites (i.e. the completion criteria for BCC) in seven of the 12 LTM blocks, but insufficient in the other five blocks (~26-46% of reference sites average). Native species assemblages were satisfactory against completion criteria in all LTM blocks monitored, with between 81.6-100.0% of all native species in each block comprised of species representative of the target communities.

Average tree stem densities were highly variable and ranged from a very low ~77 stems/ha to an extremely high ~3,900 stems/ha. Overall, seven of the LTM blocks were assessed as having adequate tree stem densities, while two blocks had insufficient tree densities and two blocks had excessive tree densities.

Seven of the 12 LTM blocks returned a BAM compositional attribute score within the defined completion criteria, whilst the BAM functional attribute score was consistently below completion criteria targets in all blocks. However for most locations, the low BAM scores mainly reflected the still relatively young ecological age of the rehabilitation, and should naturally improve as the vegetation matures.

Average cumulative priority weed cover exceeded allowable levels in three of the 12 LTM blocks; whilst an additional four blocks had an average cover below triggers but displayed variance levels exceeding triggers, i.e. indicating locally high weed levels within the blocks. Priority weed grasses by far represented the

biggest issue across the monitored LTM blocks, and the greatest threat to rehabilitation success. Other problematic species of concern consisted of woody weeds including Lantana, Golden Wreath Wattle and/or Sugar Gum.

8.6.1.2 Reference Site Monitoring

Monitoring was conducted at four reference sites in 2023 located within each of the following vegetation communities:

- PCT 1603 - Central Hunter Grey Box – Ironbark Woodland Endangered Ecological Community (EEC)(two sites).
- PCT 1604 - Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC.
- PCT 1731 - Swamp Oak Forest.

Overall, the 2023 monitoring results highlighted the ongoing good vegetation condition at the grassy woodland/forest reference/ecological monitoring sites. At the riparian Swamp Oak Forest site, weed incursion remained the main issue impacting vegetation quality, with Lantana and exotic grasses being highly problematic and requiring management if vegetation condition and integrity scores are to be improved.

8.6.2 Rehabilitation Trials and Research

8.6.2.1 Tree Thinning Trial

A tree thinning trial commenced in 2021 across areas of rehabilitation on the Noise and Visual Bund in response to monitoring results demonstrating higher than desired densities of Eucalypt species leading to suppression of understory Central Hunter Grey Box-Ironbark Woodland EEC species. A team of experienced land management and environmental restoration contractors conducted the tree thinning using the cut and paint method. Areas subject to thinning works will be monitored in subsequent years to assess EEC development.

The 2023 rehabilitation monitoring program assessed areas that had been previously thinned for success and identified areas for future tree thinning. Based on monitoring findings to date, further thinning of the tree layers is not recommended for immediate implementation but will likely be required in the future in areas of excessive stem densities (>1,000 stems/ha) to encourage the development of adequate community structure. Where implemented, selective tree thinning should be based on consideration of:

- Species composition – remove species that are not characteristic of the targeted community first, then species that are acceptable but not key diagnostic species of the community, such as Red Gums where they are over-represented. Wherever possible, species to be retained should be biased towards Grey Box and Ironbarks (Central Hunter Grey Box – Ironbark Woodland), and Ironbarks, Spotted Gum and Grey Box (Central Hunter Ironbark – Spotted Gum – Grey Box Forest), whilst retaining scattered individuals of other canopy and sub-canopy species (e.g. Cooba, Smooth-barked Apple, Bulloak, Red Gum, etc).
- Growth habit and health condition – individuals selected for removal should in priority be those displaying poorer growth habit and/or poorer health condition, with the most robust and healthiest individuals retained.

- Stem densities – aim to retain approximately 400–500 stems/ha (Central Hunter Grey Box – Ironbark Woodland) to 600–800 stems/ha (Central Hunter Ironbark – Spotted Gum – Grey Box Forest), which represents one tree per ~20–25 m^2 (or ~4–5 m spacings between tree stems) for Central Hunter Grey Box – Ironbark Woodland, and one tree per ~12–16 m^2 (or ~3–4 m spacings between tree stems) for Central Hunter Ironbark – Spotted Gum – Grey Box Forest. Heavy thinning must be avoided so to not excessively open the canopy and encourage colonisation by weeds and exotic grasses, and thinned areas will require increased and proactive weed control effort.
- During thinning works, tree trunks and large limbs >10 cm in diameter should be used as ground logs and smaller branches mulched in situ or used as coarse woody debris.

In 2024 Bulga Coal will assess performance through the annual rehabilitation monitoring program and continue to implement tree thinning in select areas as per ecologist recommendations.

8.7 Key Issues that may Affect Rehabilitation

A review of the rehabilitation risk assessment was undertaken in 2022 in accordance with *RR Guideline*: *Rehabilitation Risk Assessment*. Risks and controls identified through this process have been incorporated in the RMP. The key risks to rehabilitation at Bulga Coal are:

- potential contamination of disturbance areas
- spontaneous combustion of exposed coal seams in highwalls
- spontaneous combustion impeding rehabilitation
- tailings does not consolidate sufficiently to allow capping to progress as planned
- adverse surface and groundwater quality and quantity
- lack of habitat structures for colonisation or use
- softwall instability
- erosion within rehabilitation areas
- extended water ponding or redirection of creek and river flows.

Key risks to rehabilitation are included in a rehabilitation TARP within the RMP and to identify required management actions in the event of impacts to rehabilitation, or where rehabilitation outcomes are not achieved in an acceptable timeframe.

Ongoing works will be undertaken throughout the life of the operation to ensure rehabilitation areas meet completion criteria and rehabilitation objectives. These works will mostly include weed control, erosion repairs and planting/seeding to meet the requirements of target vegetation communities. Identification of these works will be through the rehabilitation monitoring program and annual walkover inspections.

8.7.1 Bulga Open Cut

8.7.1.1 Weed and Pest Species

Weed management in rehabilitation areas is an ongoing challenge for all mining operations. Considerable planning is undertaken at Bulga Open Cut to prevent weeds entering rehabilitation areas in the first instance, primarily through topsoil management. Despite this, several weed species are present throughout most historical rehabilitation areas and significant resources are dedicated to their removal. The methods employed at Bulga Open Cut include:

- appropriate topsoil management, including scalping of topsoil stockpiles prior to spreading and weed control in areas prior to stripping
- seeding with quick establishing cover crops and acacia species to out-compete weed species
- ongoing weed spraying and removal
- seeding with a eucalypt and acacia heavy native woodland seed mix to shade-out introduced weed species such as Rhodes grass (*Chloris gayana*) and Galenia (*Galenia pubescens*).

The key weed species targeted in 2023 were Lantana (Lantana camara), Rhodes Grass (*Chloris Gayana*), Pampas Grass (*Cortaderia selloana*), Galenia (*Galenia pubescens*), African Boxthorn (*Lycium ferocissimum*), Golden Wreath Wattle (*Acacia Saligna*), Blue Heliotrope (*Heliotropium arboescens/amplexicaule*) Queensland Silver Wattle (Acacia podalyri*lfolia*), Spiny Rush (*Juncus acutus*), Setaria Grass (*Setaria species*), Kikuyu (*Cenchrus clandestinus*), Coolatai Grass (*Hyparrhenia hirta*), African Love Grass (*Eragrostis curvula*), Pigeon Grass (*Setaria sphacelate*), Japanese Bristlegrass (*Setaria faberi*), Green Foxtail (*Setaria verdis*), and Dakota Mock Vervain (*Glandularia bipinnatifida*).

The 2024 rehabilitation weed management program will continue to implement controls for the above-mentioned weed species plus any additional weeds identified during inspections and previous monitoring programs. Control of weeds will be undertaken in order of priority according to biosecurity duties and actions required to achieve target vegetation communities.

As part of the dog baiting program, 1080 baits were placed in rehabilitation areas where the presence of wild dogs has previously been identified.

8.7.1.2 Erosion and Water Quality

Drainage structures such as contour banks and drop structures at Bulga Open Cut are largely functioning as designed and require little to no maintenance.

During 2023 Bulga continued to implement the annual landform stability and drainage inspections across all rehabilitation areas and associated drainage structures. The inspection was undertaken by a consulting engineer to identify erosion features such as rills, tunnelling, silt accumulation and overtopping drains. Spatial data was collected for all erosion and drainage maintenance features identified across all rehabilitation areas. The inspection noted a marked improvement in landform stability from previous inspections with a reduced number of erosion and maintenance issues identified.

Spatial data from the 2021 and 2022 inspections was used to develop a maintenance program which was implemented in 2023. Maintenance works undertaken included repairing rock lined drainage lines, desilting contour banks, repairing rilling and gully erosion and tunnelling. Coir logs were also successfully used to prevent and stabilise minor rill erosion across natural landform areas.

In 2024 a subsequent landform stability and drainage inspection will be conducted to identify any new erosion features or maintenance issues and assess the success of the 2023 maintenance program. Budget has been allocated to rehabilitation maintenance to allow for works to be conducted throughout the year and in response to new erosion identified following high rainfall events.

Monthly water quality sampling is undertaken on all sediment dams downstream of rehabilitated areas. Biannual water quality analysis is also undertaken on the sediment dams. This monitoring will be used to assess when surface water runoff can be diverted back into clean water catchments.

8.7.1.3 Safety Risks

There are currently no rehabilitation areas that present safety risks to the public or employees. At the time of mine closure (in year 2039 based upon current approvals), the proposed final void and highwalls will be rehabilitated in accordance with the Bulga Coal RMP and appropriate safety controls will be implemented.

8.7.2 Bulga Underground Operations

8.7.2.1 Weed and Pest Species

Due to the small and isolated nature of rehabilitation and the maintenance of buffer land at Bulga Underground Operations, weed and pest management activities are not isolated to rehabilitation areas. Weed and pest management, inclusive of rehabilitation was undertaken throughout 2023 as outlined in **Section 6.7.**

8.7.2.2 Erosion and Water Quality

Maintenance of erosion controls identified during scheduled and routine inspections was undertaken during 2023.

8.7.2.3 Safety Risks

There are currently no Bulga underground rehabilitation areas that present safety risks to the public or employees.

8.8 Actions for the Next Reporting Period

8.8.1 Rehabilitation Outcomes

The rehabilitation outcomes have been agreed with stakeholders and documented in the RMP which is available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/management-plans). It is noted that the Regulation commenced on 2 July 2021, with a transition period of 2 July 2022. Following the transition period, Mining Operations Plans cease to exist in NSW. The Bulga Coal RMP and associated works include rehabilitation outcomes.

The Bulga Coal Rehabilitation Objectives Statement (ROBJs) and Final Landform Rehabilitation Plan (FLRP) were approved by the NSW RR on 18 October 2023. Completion criteria are currently being reviewed following approval of the ROBJs and FLRP and will be submitted to the RR in 2024.

8.8.2 Proposed Rehabilitation Trials, Project and Initiatives

Bulga plans to develop a topsoil trial in 2024 to help assess the best strategy to manage the topsoil deficit whilst meeting our rehabilitation objectives.

8.8.3 Rehabilitation Activities Proposed for 2024

Bulga Coal plans to undertake the following rehabilitation and disturbance works during 2024:

- 5.1 ha of disturbance
- 31.8 ha of rehabilitation (levelled/re-contoured, topsoiled and seeded)
- 80.5 ha of rehabilitation disturbance
- maintenance works as required on existing rehabilitation areas
- subsidence repairs as required.

The proposed 2024 operations for Bulga Open Cut have been presented in **Figure 4.3**.

9.0 Community

9.1 Community Engagement

Bulga Coal engaged with the community through meetings and community barbeques in 2023.

9.1.1 Community Barbeques

Four community barbeques were held in May and November 2023. In May 64 people attended the event in Broke and 70 attended the event in Bulga. In November 90 people attended the event in Bulga and 88 attended the barbeque in Broke. The format of the barbeques in May was a sit down buffet barbeque meal and mine presentation; while November was a casual cocktail style celebration and get together (**Photo 9.1**).

Photo 9.1 Community Barbeque at the Broke Hall in May, 2023

9.1.2 Newsletters

A community newsletter was distributed to letterboxes in Broke, Milbrodale and Bulga in July 2023. The newsletter included an article and flyer insert regarding the proposed changed final landform modification (Mod 5).

9.1.3 Community Consultative Committee

Bulga Coal enjoys an open and honest dialogue with community representatives and Singleton Council through our Community Consultative Committee. Bulga Coal hosted meetings in May and November 2023. Minutes from the CCC meetings are available on the Bulga Coal website (https://www.glencore.com.au/operations-and-projects/coal/current-operations/bulga-coal/community-documents). One community member resigned from the committee during the year and that position will be advertised in 2024.

9.1.4 Voluntary Planning Agreement

Bulga Coal made payments for Part B (Broke Road Maintenance) and Part C (Community contributions to local events and education) during 2023.

9.1.5 Broke to Bulga Discovery Trail Feasibility Study

Bulga Coal and the Broke Residents Association finalised the feasibility study for a proposed shared walk and cycle trail between Broke and Bulga. The proposed route aims to showcase our community assets and provide access to local bushland including Minimbah Teaching Place. The study concluded the proposed trail was economically and technically feasible. Bulga Coal provided assistance to the Broke Residents Association in an application for funding for the next stage: the Concept Trail Plan through the Singleton Community Economic Development Fund in October 2023. We will continue to work with the community and Singleton Council during 2024 to progress the project.

9.1.6 Mine Tours

Bulga Coal participated in the Upper Hunter Mining Dialogue school tour program with around 30 primary school students visiting the mine in September 2023 (**Photo 9.2**). We also hosted additional school tours with a focus on rehabilitation and final land use options (**Photo 9.3**). Bulga Coal hosted mine tours as part of the Broke Village Fair in September.

Photo 9.2 Small schools mine tour as part of the Upper Hunter Mining Dialogue program

Photo 9.3 Post mining land use ideas from students during rehabilitation and mine tour 2023

9.2 Community Sponsorship and Donations

Bulga Coal contributed approximately $120,000 in sponsorships and donations in 2023 and supported several projects throughout the year.

9.2.1 Broke School

The school purchased collaborative furniture for the school library with the annual contribution in Bulga Coal's Voluntary Planning Agreement in 2023. The school also opened their STEM learning room in July with furniture and equipment purchased with Bulga Coal's Voluntary Planning Agreement funding from 2022.

9.2.2 Broke Bulga Landcare

Bulga Coal is a collaborating partner of the Wollombi Brook Habitat Restoration - Linking communities with Icon Species, with Hunter Local Land Services, Broke Bulga Landcare and Singleton Council. The project involves engaging and supporting the local community to restore and protect riparian habitats for target species populations including Hunter River Red Gum, Hunter River Short-neck Turtle, platypus and the native water rat. 2023 was the first year of a 4-year project, with funding provided by the NSW Environmental Trust.

9.2.3 Community Yoga Classes

Bulga Coal continued supporting weekly yoga classes in Broke during 2023. The classes were well attended and appreciated by the community.

9.2.4 Broke Village Fair

Bulga Coal is the major sponsor of the annual Broke Village Fair. Bulga Coal works in partnership with the Fair committee, participating in the committee and marketing the event. Native trees were handed out in the Bulga Coal marquee and around 300 people enjoyed bus tours to the Bulga Open Cut mine.

9.2.5 Broke Fordwich Wine and Tourism Association

We continued our long-standing support of the Broke Fordwich Wine and Tourism Association by sponsoring a regional digital media campaign. We had ongoing discussions regarding their flagship event, A Little Bit of Broke in 2024 and local collaboration regarding Broke and Bulga bicentennial celebrations in 2024.

9.2.6 Sponsorships

Organisations and events sponsored by Bulga Coal during 2023 included:

- Singleton Parkrun: upgrade to the Parkrun course in a joint sponsorship with United Wambo Joint Venture (**Photo 9.4**).
- Milbrodale Mountain Classic
- Soft Cogs MS Gong Ride
- Broke Fordwich Wine and Tourism Association: regional digital marketing campaign
- Broke Village Fair and Vintage Car Display
- Broke Residents Association events: Christmas with the Neighbours
- Singleton Tidy Towns Adopt a Spot Broke Road Clean-up
- Singleton Community Garden: Apprentice working bee to build 8 garden beds (**Photo 9.5**)
- History of Singleton Dairy Cooperative book: sponsorship of print production costs
- Singleton Library – Summer Reading Program
- Broke Public School – Library furniture.

Photo 9.4 Sponsorship of Singleton Parkrun track upgrades

Photo 9.5 Apprentice working bee at Singleton Community Garden

9.2.7 Donations

Donations were made to these recipients in 2023:

- Singleton Track and Field
- East Maitland Junior Rugby League Club
- Headspace
- Bulga Milbrodale Progress Association: Anzac Day ceremony
- Kiray Putjung: Naidoc Family Day Cessnock
- Kurri Kurri Junior Motorcycle Club
- Hunter Melanoma Fund
- Hunter Food Relief
- Singleton Neighbourhood Centre: Approximately 140 high quality toys (doll houses, bmx stunt bikes, cubby houses, kitchens and billy carts) were crafted during a team building exercise by 800 employees. The toys were donated and delivered to families in need in Singleton in time for Christmas (**Photo 9.6**).

Photo 9.6 **Bulga Open Cut Team Building Exercise in December 2023, over 140 high quality toys were donated to the Singleton Neighbourhood Centre for families in need.**

9.3 Community Complaints

During the reporting period, 8 community complaints were recorded from 5 stakeholders, with one stakeholder recording 3 lighting complaints. Of the 8 complaints, 4 complaints related to noise, 3 related to lighting, and 1 related to blasting road closure signage. **Table 9.1** shows a comparison of the environmental complaints received by Bulga Coal during the reporting period against the previous five years.

Table 9.1 Summary of Complaints by Issue 2018–2023

Complaint Type	2018	2019	2020	2021	2022	2023
Blast vibration/ overpressure	0	1	2	1	1	0
Lighting	3	5	2	0	1	3
Dust	3	4	1	2	0	0
Noise	14	11	12	10	15	4
Traffic	0	0	0	0	0	0
Visual Amenity	2	2	0	0	0	0
Odour	0	0	0	0	0	0
Fume	0	0	0	0	0	0
Other	0	1	0	1	0	1
Total	**22**	**24**	**17**	**14**	**17**	**8**

Each of these complaints followed the *Bulga Coal Community Complaint Procedure* and the response is available in the complaints register on the Bulga Coal website (https://www.glencore.com.au/.rest/api/v1/documents/42cf6e45b945383e99afa86bb4d9707e/Complaints+Register+-+December+2023.pdf).

9.4 Community Feedback

Bulga Coal receives formal and informal feedback about the consultation program and environmental performance.

Bulga Coal consulted with the community in relation to the proposed changed final landform modification (Mod 5) at CCC meetings, community barbeques, Broke Fair and in the newsletter. No concerns were raised by the community, and consultation will continue throughout 2024.

Bulga Coal continued to receive positive feedback from the community regarding Minimbah Teaching Place. Projects with the Aboriginal community have been well supported and positive, including the design of the bush tucker garden and working bees; and cataloguing salvaged artefacts.

We were recognised for our contribution and support for the emergency flood recovery in Broke and Bulga in July 2022. Bulga Coal received the President's Award at the 2023 Singleton Business Awards gala presentation and were a finalist in the 2023 NSW Mining HSEC Awards in the Community Excellence category (**Photo 9.7**). Bulga Coal has been meeting with Broke Residents Association about planning and support for Broke's 200-year bicentennial celebrations in 2024. We will continue to work with local community groups in Broke and Bulga in 2024 to celebrate European and Indigenous heritage.

Photo 9.7 Singleton Business President's Award for Bulga Coal's response to the Broke and Bulga Flood Recovery

10.0 Independent Audit

10.1 2021 Independent Environmental Audit

In accordance with the requirements of Schedule 5, Conditions 9 and 10 of SSD-4960, Condition 8.4 of DA 41-03-99 (now surrendered) and Schedule 6, Conditions 6 and 7 of DA 376-8-2003, an Independent Environmental Audit (IEA) was undertaken for Bulga Coal in 2021. The audit was conducted in November 2021 and was approved by DPHI on 6 April 2022.

The audit found that approximately 41% of all conditions and commitments were found to be compliant, 55% not triggered and 4% were non-compliant. A summary of non-compliances and the status of the proposed actions is presented in **Table 10.1**. Actions that are ongoing, required no action or were completed prior to this Annual Review period have been excluded.

Table 10.1 Non-Compliance Findings and Action Status from 2021 IEA

Non-Compliance Reference	Finding	Action Proposed by Bulga Coal	By When	Action Status
SSD-4960 Schedule 3 Condition 17	Several exceedances of 24-hour PM_{10} assessment criteria were recorded by the Bulga Coal air quality monitoring network during the audit period. While standard Glencore tenancy agreements are issued that include advice on health risks associated with exceedances, currently tenants of these properties are not notified of exceedances when they occur. Recommendation: Where exceedances of particulate emission limits occur, ensure that notification is provided for tenants on mine owned land.	Bulga will notify tenants of mine owned properties if the air quality criteria is exceeded in the region of the properties as a result of Bulga Coal emissions.	Triggered by exceedance	Not triggered within the reporting period.
SSD-4960 Schedule 3, Condition 27	Multiple discharge events of sediment laden water and chemical and hydrocarbon storage at workshop. Recommendation: Ensure chemical and hydrocarbon storage is periodically reviewed for compliance against the relevant Australian standards.	Undertake a compliance review against the relevant Australian Standards for chemical and hydrocarbon storage across site.	30 June 2023	Completed.
Schedule 3, Condition 53	Rehabilitation Objectives. Recommendation: Ensure topsoil stockpiles are signposted to reduce chance of disturbance or dumping.	Install sign posts for topsoil stockpiles to reduce the chance of disturbance or dumping.	31 December 2022	Completed.

11.0 Incidents and Non-Compliances During the Reporting Period

Incidents and non-compliances which are considered as low risk of environmental harm are detailed in this section.

11.1 Noise affected night during the attended noise monitoring at BCC7

On the night of 6 November 2023, during the attended noise monitoring at the BCC7 Monitoring location (179 Cobcroft Road), the night $LA_{eq,15\text{-}minute}$ criterion of 36 dB was exceeded.

At 22:28 an exceedance of 1 dB of the 36 dB LAeq was measured at BCC7. The noise consultants notified Dispatch of the exceedance; Dispatch communicated this to the OCE who had been already on Milbrodale Road monitoring noise after modifying operations. Regrettably Dispatch did not relay the exceedance location to the OCE, who continued to monitor noise on Milbrodale Road where levels remained below the criteria.

At 23:26 the remeasurement at BCC7 was completed, recording a 38 dB of mine noise, a 2 dB low frequency modifying factor was also applicable resulting in a total of 40 dB; which exceeded the 36 dB criteria by 4 dB, resulting in a Noise Affected Night.

Upon review of the meteorological data both readings were deemed valid and no enhancing conditions were applicable. In accordance with Bulga's Noise Management Plan a remeasurement was completed at BCC7 at 11:36pm on 10 November 2023 recording LAeq levels from Bulga Coal Operations of 27 dB, well below the 36 dB Night criteria. The meteorological conditions during the nights are presented in **Table 11.1**.

Table 11.1 Meteorological Conditions during the nights of 6/7 and 10 November 2023

Location	Start date and time	Wind		Stability class	Very Enhancing
		Speed	Direction		
BCC1	6/11/2023 22:36	2.1	100	F	Yes
BCC2	6/11/2023 23:30	1.9	123	F	No
BCC3	7/11/2023 0:30	1.7	124	F	No
BCC4	7/11/2023 0:30	1.7	124	F	No
BCC5	6/11/2023 22:59	2.1	119	F	Yes
BCC7	**6/11/2023 22:28**	**1.9**	**95**	**F**	**No**
BCC7 (remeasurement)	**6/11/2023 23:26**	**1.9**	**123**	**F**	**No**
BCC7 (follow up measurement)	**10/11/2023 23:36**	**0.1**	**229**	**F**	**No**
BCC8	6/11/2023 22:00	1.3	123	F	No
BCC9	7/11/2023 1:02	1.7	135	F	No
BCC10	7/11/2023 0:00	2.4	126	F	Yes

Actions taken during the night:
At 21:30 in response to alarms at the Milbrodale Road monitor, operations were modified to reduce levels noise levels at the monitor location; excavator and associated trucks were parked up to reduce levels.

Levels at the Milbrodale Road monitor remained under the 35 dB criteria, until 23:36 when an alarm was recorded. Additional equipment was parked up to reduce noise levels at the Milbrodale Road monitor location, bringing the levels under criteria. Trucks, excavators and dozers were shut down for a total of 91 hours, during the shift.

Action taken following the noise affected night:

- Follow up measurement completed on 10 November 2023 recorded 27 dB from Bulga Coal, which is well below the 36 dB criteria.
- Additional monitoring was completed at BCC7 on the days following the exceedance at the monitoring location; no exceedances were recorded at the location.
- Additional refresher training to be carried out with Dispatch and OCE's regarding the attended noise monitoring and response requirements.

11.2 Administrative Non-Compliance

11.2.1 Failure to Continuously Monitor Air Quality

PM_{10} air quality data was not monitored continuously at EPA Point 9 and Point 10 due to the equipment failure or planned maintenance at various times during 2023. For the reporting period 97.8% of valid data was captured for EPA Point 9, and 99.2% of valid data was captured for EPA Point 10.

The cause of the breakdowns were investigated promptly, and the monitors were fixed. Details were reported to the EPA in the 2022–2023 EPL 563 Annual Return, and are included in the *Annual Air Quality Report* in **Appendix B.**

$PM_{2.5}$ air quality data was not monitored continuously at air quality monitors D2 and D10 due to equipment failure, power outages and planned maintenance at various times during the reporting period. Valid data was recorded for 98.6% and 98.5% of 24-hour events during the reporting period respectively.

PM_{10} air quality data was not monitored continuously at air quality monitors D1, D3, D5 and D11 due to equipment failure, power outages and planned maintenance at various times during the reporting period. Valid data was recorded for 98.6%, 96.2%, 98.5% and 98.1% of 24-hour events during the reporting period respectively.

The cause/s of the breakdowns were investigated promptly, and the monitors were fixed. Further details are included in the *Annual Air Quality Report* in **Appendix B.**

11.2.2 Failure to Monitor Humidity Data

Humidity data was not monitored continuously at EPA Point 20 – Flares Meteorological Station at various times during 2023.

Relative humidity was not monitored continuously at the Flares Meteorological Station due to an equipment failure on the relative humidity sensor failing intermittently during July and August 2023; the sensor was replaced in September 2023. During November 2023 the Flares relative humidity sensor recorded erroneous data; this was identified and fixed in early December 2023.

Details were reported to the EPA in the 2022–2023 EPL 563 Annual Return and further details are included in the *Annual Air Quality Report* in **Appendix B.**

11.2.3 Failure to Continuously operate communication equipment at the HRSTS discharge point (EPA Point 11)

HRSTS communications were interrupted to the Water NSW website and were not permanently re-established for over a month. The interruption was related to low voltage issues and insufficient backup battery life, which damaged the Water NSW modem. Communications were not interrupted to the Bulga internal SCADA system or the internal HRSTS portal.

Corrective actions taken included:

- an upgraded modem was ordered and installed
- the backup battery system was upgraded to a two-battery system
- low voltage cut off protection was installed for the modem
- the dam level pump enclosure was upgraded
- the dam level power supply was upgraded to a 12 v power supply with external battery storage and solar panel.

12.0 Activities to Be Completed in the Next Reporting Period

12.1 Proposed Activities

The works listed in **Table 12.1** will be completed in 2024 at Bulga Coal to improve the environmental and/or community performance of the operation.

Table 12.1 Bulga Coal Proposed Activities 2024

Topic	Proposed Activity	By When
Weeds and Pests	Commence implementation of long term integrated weed management action plans for offsets and buffer land.	Q2
Rehabilitation	Continue weed control, erosion repairs and planting/seeding to meet the requirements of target vegetation communities at Bulga Underground Operations.	Ongoing
	Develop a topsoil trial in 2024 to help assess the best strategy to manage the topsoil deficit whilst meeting our rehabilitation objectives.	Q4
Noise	Purchase and commission of 6 additional new Komatsu 930E haul trucks to replace Cat 793 trucks. Komatsu 930E haul trucks have sound power levels of approximately 2 dB less than the Cat 793 trucks they are replacing.	Q3
Community	Complete concept plan for the proposed Shared Walk and Cycle Trail between Broke and Bulga.	Q4