YANCOAL
兖煤澳大利亚有限公司
MT THORLEY WARKWORTH



Mount Thorley Warkworth

2024 Annual Review

Name of Operations	Mount Thorley Warkworth
Name of Operator	Coal & Allied (NSW) Pty Ltd (wholly owned subsidiary of Yancoal Australia Ltd)
Development consent /project approval	SSD-6464 & SSD-6465
Name of holder of development consent/project approval	Warkworth Mining Ltd Mt Thorley Operations Pty Ltd
Mining Lease #	Contained within Section 3.1 of this report
Name of holder of mining lease	Warkworth Mining Ltd Mount Thorley Operations Pty Ltd
Water Licence #	Contained within Section 3.1 of this report
Name of holder of water licence	Contained within Section 3.1 of this report
Annual Review Start Date	01/01/2024
Annual Review End Date	31/12/2024

I, Gary Mulhearn, certify that this audit report is a true and accurate record of the compliance status of Mount Thorley Warkworth for the period 1 January 2024 to 31 December 2024 and that I am authorised to make this statement on behalf of Coal & Allied (NSW) 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 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 the 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	Mr Gary Mulhearn
Title of Authorised Reporting Officer	Environment and Community Manager
Signature of Authorised Reporting Officer	
Date (Version V1)	5 June 2025

Executive Summary

Mount Thorley Warkworth (MTW) is an integrated operation of two open cut coal mines, Warkworth Mining Limited (WML) and Mount Thorley Operations (MTO). This Annual Review reports on the environmental performance of MTW for the period 1 January 2024 to 31 December 2024.

This report has been prepared in accordance with conditions of the development consents held by MTW which require a report of the operation's environmental performance to be provided on an annual basis. The structure of the 2024 Annual Review aligns with the NSW Department of Planning Housing and Insfrastructure (DPHI) *Post-approval requirements for State significant mining developments – Annual Review Guideline* (October 2015).

MTW produced 17.24 million tonnes of run-of-mine (ROM) coal during 2024, and 11.22 million tonnes of saleable coal. ROM coal from WML and MTO was produced at less than the approved ROM coal production rates for WML (18 Mtpa) and MTO (10 Mtpa).

Noise

There were three non-compliances recorded against MTW's consented noise limits in relation to WML on 1 February 2024 (1dB), 22 April 2024 (1dB), and 7 May 2024 (2dB), all of which were caused after application of a low-frequency modifying factor of +2dB. In May 2024, MTW finalised the training and implementation of new handheld noise monitors and a post processing application (developed over 2023-2024) to allow supplementary noise readings undertaken by MTW personnel, to have the capability to identify noise parameters which can be used for low frequency noise assessment. Since May 2024, the supplementary noise readings undertaken by MTW personnel can assess for low frequency modifying factors. Since the implementation of the new monitoring equipment there were no further exceedances recorded in 2024. DPHI assessed the noise exceedances, and measures to prevent reoccurrence, and elected to issue a Warning Letter in response. There was an increase (from 143 to 166) in the number of supplementary attended noise measurements which exceeded the internal trigger levels for corrective action compared to 2023. A total of up to 3,835 hours of mine equipment stoppages were recorded as a result of proactive and reactive measures to minimise noise and ensure compliance with noise criteria.

Blasting

During the reporting period 260 blast events were initiated at MTW and all blasts returned results below the relevant ground vibration criteria for all monitoring locations. One (1) blast event on 20 June 2024 at WML recorded an air blast overpressure result of 122.7 dB(L) at the Putty Rd MTIE monitoring location and an air blast overpressure result of 120.6 dB(L) at the Abbey Green monitoring location which were exceedances of the 120 dB(L) threshold for air blast overpressure at these monitoring locations. These exceedances were reported to DPHI as required by the WML development consent, and DPHI assessed the written report including measures to prevent a reoccurrence and elected to issue a Warning Letter in response.

Air Quality

During 2024, MTW complied with all short term and annual average air quality criteria. A total of up to 2,570 hours of mine equipment stoppages were recorded as a result of proactive and reactive measures to minimise dust and ensure compliance with air quality criteria.

Heritage

Aboriginal and Historic heritage matters continued to be managed in accordance with the Aboriginal Heritage Management Plan (AHMP) and Historic Heritage Management Plan (HHMP). Subsurface investigation of a Potential Archaeological Deposit (PAD) location did not identify subsurface artefacts or a stratified soil deposit warranting further investigation; eleven (11) surface artefactual pieces were salvaged from the surrounding area, catalogued, and transported to the MTW cultural heritage storage area. Two new Aboriginal cultural heritage sites were identified during the AHMP compliance inspection and were added to AHIMS and MTW databases. Structural engineering inspections of key historic heritage sites were undertaken and initial structural stabilisation works completed at Springwood Homestead. Annual compliance inspections were completed and no heritage incident or unauthorised site disturbance was identified.

Surface Water

2024 was a drier than average year with a total of 590 mm of rainfall recorded at MTW's Charlton Ridge Meteorological station. The average annual rainfall at Charlton Ridge is 682mm, as calculated from 2007 to 2023 annual totals.

Groundwater

Groundwater monitoring activities were undertaken in 2024 in accordance with the MTW Water Management Plan and groundwater monitoring programme. The monitoring results are used to establish and monitor trends in physical and geochemical parameters of surrounding groundwater potentially influenced by mining.

Groundwater monitoring data is reviewed on a quarterly basis and is included in the March, June, September and December Monthly Environmental Monitoring Reports, available at https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mon-docs

Visual Amenity

Slashing works were undertaken in 2024 along Putty Road, improving visual amenity. A visual bund was constructed along the Putty Road and WML West Pit area during 2024. Additional shade cloth screening installed in 2024, with existing remaining in place on chainmesh boundary fencing along Putty Road, whilst planted native vegetation is establishing to permanent visual screening between areas of established vegetation adjacent to the Warkworth open cut mining activities.

Rehabilitation and Land Management

A total of 100.6ha of new rehabilitation (rehabilitation progressed to Ecosystem and Land Use Establishment phase) was completed during 2024 which was 19.4ha more than the Forward Program 2024 target of 81.2ha. Total disturbance undertaken in 2024 was 65.4ha against a Forward Program

target of 78.7ha. This disturbance included 11.8ha of rehabilitation disturbance. The reduced amount of disturbance was due to disturbance ahead of mining being delayed in West Pit and North Pit.

Biodiversity and Offset Management

Restoration of the Warkworth Sands Woodland vegetation community continued with 15,100 tube stock planted in the Northern Biodiversity Area (BA) and 4,000 planted in the Southern BA. Planting at the Southern BA also included planting 1,460 River Oak Forest and 4780 Central Hunter Grey-Box Ironbark Woodland species tube stock. Rapid Condition Assessments, Habitat Restoration and Bird Assemblage monitoring and property inspections were undertaken across all BA's in 2024.

Weed control, vertebrate pest management activities and fence repairs were conducted during 2024 in accordance with the Offset Management Plans.

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1 STATEMENT OF COMPLIANCE

A Statement of Compliance against the relevant approvals is provided in **Table 1.1**. **Table 1.2** provides a brief summary of the non-compliances and a reference to where these are addressed within this Annual Review.

TABLE 1.1 STATEMENT OF COMPLIANCE

Approval	Were all conditions complied with?
DA SSD-6465 (MTO)	Yes
DA SSD-6464 (WML)	No

TABLE 1.2 NON COMPLIANCES

Relevant approval	Condition number	Condition description (summary)	Compliance status	Section in this Annual Review it is addressed.
SSD-6464 (WML)	Schedule 3 Condition 7	Compliance with noise criteria	Non-compliant	10
SSD-6464 (WML)	Schedule 3 Condition 8	Blast overpressure	Non-compliant	10

TABLE 1.3 COMPLIANCE STATUS KEY FOR TABLE 1.2

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

Source: NSW Government Post-approval requirements for State significant mining developments – Annual Review Guideline (October 2015).

2 INTRODUCTION

Mount Thorley Warkworth Coal Mine (MTW), is an integrated operation consisting of Warkworth Mining Limited (WML) and Mount Thorley Operations (MTO) situated 14 km southwest of Singleton, in the Upper Hunter Valley region of NSW **(Figure 1 & Figure 2)**. MTW is managed and operated by Coal & Allied (NSW) Pty Ltd, a wholly owned subsidiary of Yancoal Australia Limited (YAL). A summary of MTW tenements is shown in **Figure 3.**

2.1 Scope

This Annual Review (AR) covers the twelve-month reporting period from **1 January 2024 to 31 December 2024.**

This report summarises the environmental performance of MTW in accordance with conditions of the development consents held by site. The structure of this 2024 Annual Review aligns with the *DPHI Post-approval requirements for State significant mining developments – Annual Review Guideline* (October 2015).

This AR includes reference to the mining tenement of the Mount Thorley Coal Loader (MTCL), which is included in the Rehabilitation Management Plan. The MTCL operates under a Singleton Council development consent, and annual environmental reporting for the MTCL is not included within the scope of this AR.

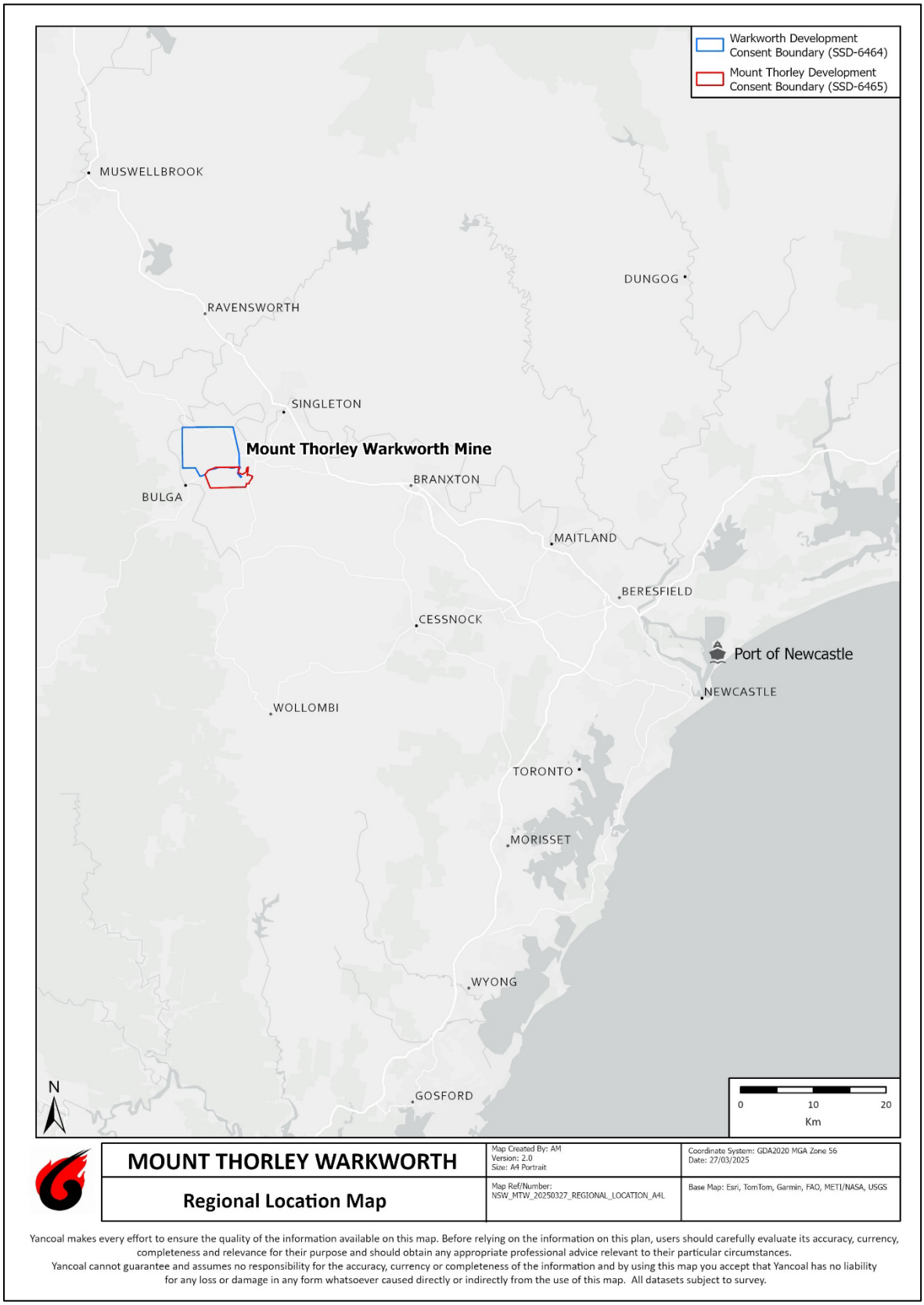


FIGURE 1: MTW REGIONAL CONTEXT

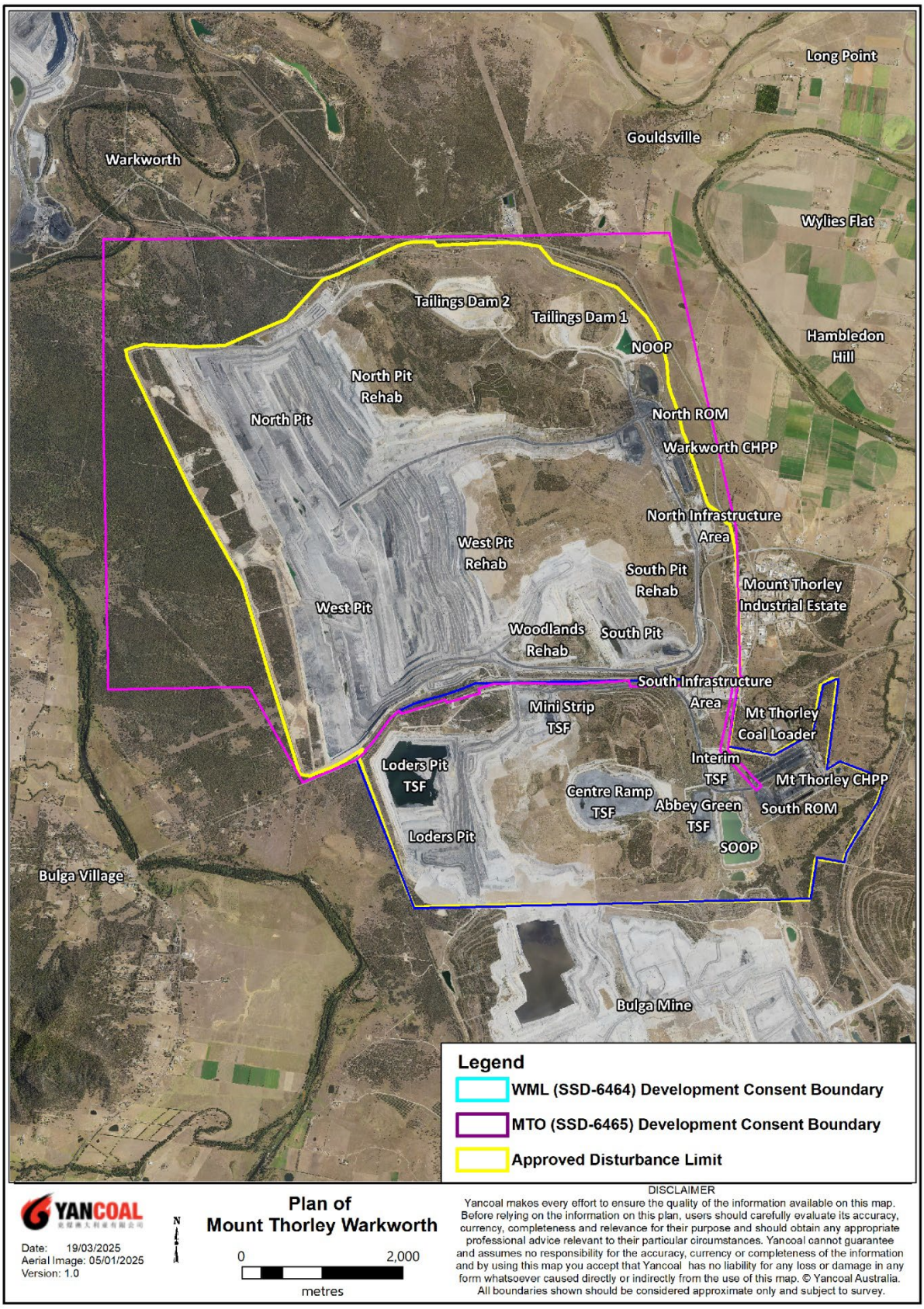


FIGURE 2: MTW SITE LAYOUT AND LOCALITY PLAN

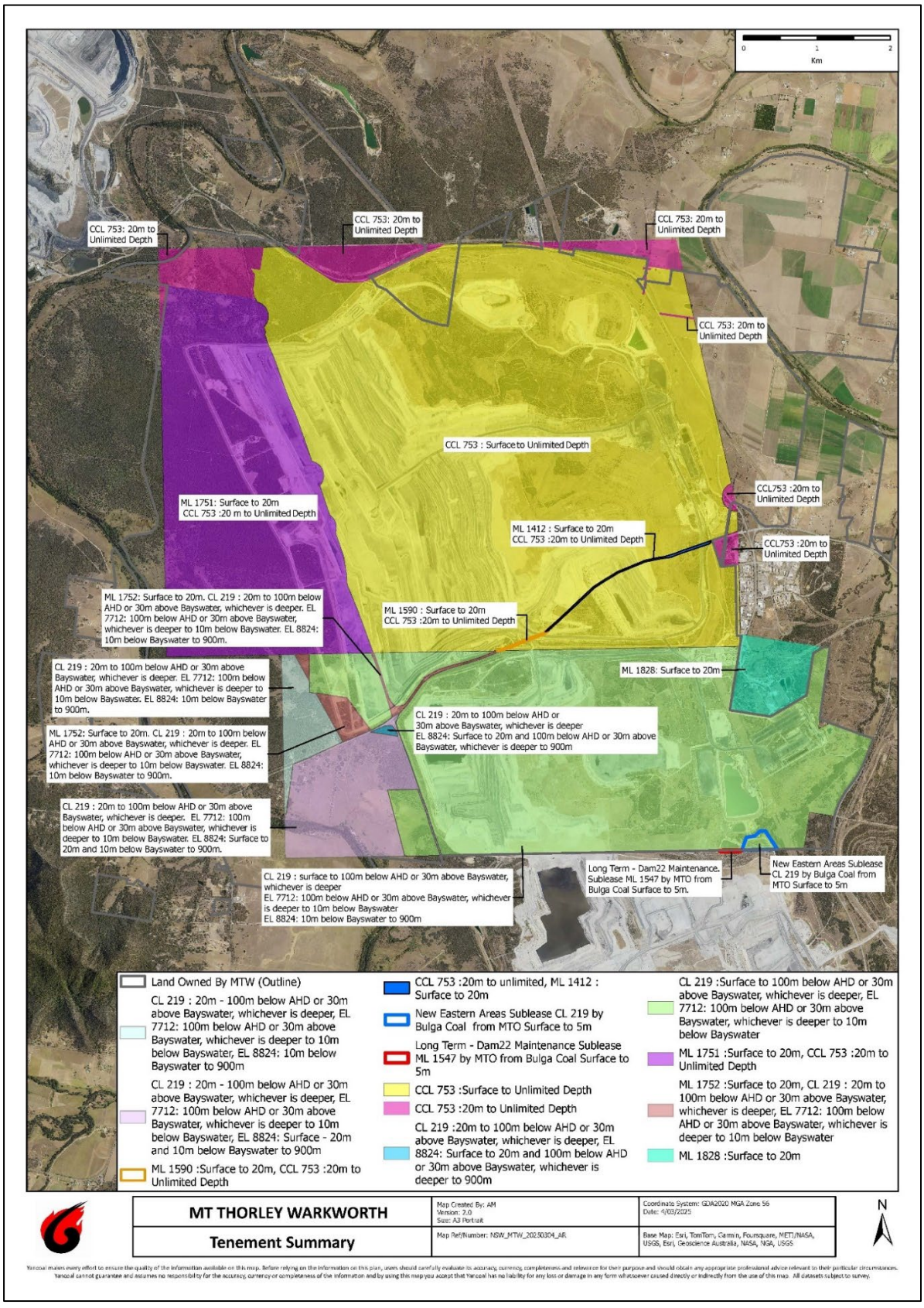


FIGURE 3: MTW TENEMENT SUMMARY

2.2 Mine Contacts

Table 2.1 outlines the contact details for site personnel responsible at Mount Thorley Warkworth.

TABLE 2.1 SITE PERSONNEL

Position	Name	Contact Number
General Manager – MTW	Cris Shadbolt	(02) 6570 1500
Environment & Community Manager - MTW	Gary Mulhearn	(02) 6570 1734

3 APPROVALS

3.1 Approvals, Leases and Licences

3.1.1 Current Approvals

The status of MTO and WML development consents, licenses and relevant approvals at 31 December 2024 are summarised in **Table 3.1** to **Table 3.6**.

TABLE 3.1 OPERATIONS APPROVALS- WARKWORTH

Approval Number	Description	Authority	Date of Approval / Variations
SSD-6464	Warkworth Continuation Project development consent.	DPHI	26/11/2015
SSD-6464 MOD 2	Modification the Warkworth Continuation Project to use the Lemington Underground as a water storage for Warkworth (and HVO); and authorise construction of the Ultra-Class truck workshop.	DPHI	27/05/2022
EPBC 2009/5081	Approval under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) to extend the existing Warkworth Coal Mine over an additional 705 hectares of land at Warkworth NSW including associated modifications to existing mine infrastructure.	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	9/8/2012 – 31/3/2033 (varied on 14/10/2018)
EPBC 2002/629	Approval under the EPBC Act to construct and operate an open cut coal mine extension at the Warkworth Coal Mine.	DCCEEW	18/2/2004 – 25/02/2039 (varied on 6/4/2004, 24/5/2004, 19/11/2004, 13/7/2012, 14/10/2018)

TABLE 3.2 OPERATIONS APPROVALS - MOUNT THORLEY

Approval Number	Description	Authority	Date of Approval / Variations
SSD-6465	Mount Thorley Continuation Project development consent	DPHI	26/11/2015

TABLE 3.3 LICENCES AND PERMITS

Licence No	Description	Authority	Date of Approval / Variations
Warkworth			
EPL 1376	Environment Protection Licence	EPA	25/10/2021
5061122	Radiation Licence	EPA	02/05/2024
XSTR200105	Licence to Store – Explosives Act	SafeWork NSW	19/08/2024
Mount Thorley			
EPL 1976	Environment Protection Licence	EPA	17/01/2024
5061110	Radiation Licence	EPA	31/07/2024

Note: Environment Protection Licences remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

TABLE 3.4 MINING TENEMENTS

Mining tenement	Type	Purpose	Status	Grant Date	Expiry Date
Warkworth Mining Ltd					
CCL 753	Consolidated Coal Lease	Mining	Granted	23/05/1990	17/02/2034
ML 1412	Mining Lease	Mining	Granted	11/01/1997	11/01/2038
ML 1590	Mining Lease	Mining	Granted	27/02/2007	26/02/2028
ML 1751	Mining Lease	Mining	Granted	17/03/2017	17/03/2038
Mount Thorley Operations Pty Ltd					
CL 219	Coal Lease	Mining	Granted	23/09/1981	23/09/2044
(Part) ML 1547	Sub-Lease	Mining	Registered	The part sublease area known as the "Dam 22 Long Term Mining Sublease" was registered on 10th January 2018 for a term until 3 April 2025.	03/04/2025

Mining tenement	Type	Purpose	Status	Grant Date	Expiry Date
ML 1752	Mining Lease	Mining	Granted	17/03/2017	17/03/2038
EL 7712	Exploration Licence	Prospecting	Granted	23/2/2011	23/02/2026
EL 8824	Exploration Licence	Prospecting	Granted Ren. Pen.	15/02/2019	15/02/2025
Mount Thorley Coal Loading Ltd					
ML 1828	Mining Lease	Mining Purposes	Granted	25/02/2022	25/02/2043

TABLE 3.5 WATER LICENCES (WATER ACT 1912)

Licence Number	Type	Purpose	Legislation	Description	Renewal Date
20BL168821	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: MTAGP1, MTAGP2, ABGOH07, ABGOH43, ABGOH44, ABGOH45	Perpetuity
20BL171729	Bore	Monitoring Bore	Part 5 Water Act 1912	G3	Perpetuity
20BL171841	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1126	Perpetuity
20BL171842	Bore	Monitoring Bore	Part 5 Water Act 1912	OH944	Perpetuity
20BL171843	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1137	Perpetuity
20BL171844	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: OH1123 (E), OH1123 (W)	Perpetuity
20BL171845	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1124	Perpetuity
20BL171846	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: OH786, OH942	Perpetuity
20BL171847	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: OH1127, OH787	Perpetuity
20BL171848	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1125	Perpetuity
20BL171849	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1122	Perpetuity
20BL171850	Bore	Monitoring Bore	Part 5 Water Act 1912	OH1138	Perpetuity
20BL171891	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: OH1121, OH788, OH943	Perpetuity

Licence Number	Type	Purpose	Legislation	Description	Renewal Date
20BL171892	Bore	Monitoring Bore	Part 5 Water Act 1914	Bores: WOH2153 (PZ2), WOH2154 (PZ1), WOH2155 (PZ4), WOH2156 (PZ3)	Perpetuity
20BL171893	Bore	Monitoring Bore	Part 5 Water Act 1918	Bores: WOH2141 (PZ6), Ground Water Alluvial Modelling	Perpetuity
20BL171894	Bore	Monitoring Bore	Part 5 Water Act 1913	WOH2139 (PZ5)	Perpetuity
20BL172272	Bore	Monitoring Bore	Part 5 Water Act 1912	PZ9S, PZ9D	Perpetuity
20BL172273	Bore	Monitoring Bore	Part 5 Water Act 1912	PZ8S, PZ8D	Perpetuity
20BL172439	Bore	Monitoring Bore	Part 5 Water Act 1912	Windermere	Perpetuity
20BL172518	Bore	Monitoring Bore	Part 5 Water Act 1912	Windermere: MBW01, MBW02, MBW03, MBW04	Perpetuity
20BL173276	Bore	Monitoring Bore	Part 5 Water Act 1912	Windermere	Perpetuity
20BL173065	Bore	Monitoring Bore	Part 5 Water Act 1912	SR012	Perpetuity

TABLE 3.6 WATER ACCESS LICENCES (WATER MANAGEMENT ACT 2000)

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Licence Allocation (ML)*	2024 Take (ML) Total
WAL963	Warkworth Mining Limited Hunter River Pump (General Security)	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	243	0
WAL10543	Mount Thorley Joint Venture (MTJV) water supply scheme, held by Singleton Shire Council	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	1,907 (MTW share is 1,009)	692

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Licence Allocation (ML)*	2024 Take (ML) Total
WAL43056	Warkworth Mining Limited (High Security)	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	2,000	0
WAL43057	Warkworth Mining Limited (High Security)	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	1,400	0
WAL18233	Old Farm	Hunter River Alluvium	Hunter Unregulated and Alluvial Water Sources WSP	Hunter Regulated River Alluvial Water Source – Downstream Glennies Creek Management Zone	5	0
WAL18558	Hawkes	Wollombi Brook	Hunter Unregulated and Alluvial Water Sources WSP	Lower Wollombi Brook Water Source	50	0
WAL19022	Sandy Hollow Creek	Unregulated River	Hunter Unregulated and Alluvial Water Sources WSP	Singleton Water Source	60	0
WAL40464 / WAL40465	Mt Thorley and Warkworth Pit Excavations	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP	Sydney Basin – North Coast Groundwater Source	180 / 750	428
WAL39798	Bore Extraction (Lemington underground)	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP	Sydney Basin – North Coast Groundwater Source	1,800	305

** Licence allocations are for 1 July to 30 June reporting year. Actual usage can exceed licence allocation in the table above if carryover provisions are available and have been applied during the water year.*

3.1.2 Management Plans, Programmes and Strategies

Table 3.7 details the management plans and strategies which are required under the Warkworth (SSD-6464) and Mount Thorley (SSD-6465) Development Consent instruments.

TABLE 3.7 STATUS OF MANAGEMENT PLANS REQUIRED UNDER WARKWORTH CONTINUATION (SSD-6464) AND MOUNT THORLEY OPERATIONS (SSD-6465) DEVELOPMENT CONSENTS

Plan / Program / Strategy	Status at end of 2024 (approval date)
Air Quality Management Plan	8/08/2022
Noise Management Plan	08/08/2022
Blast Management Plan	24/03/2023
Water Management Plan	15/11/2021
WML Biodiversity Management Plan	20/09/2018
Rehabilitation Management Plan (RMP)	Prepared 29/01/2024 Components of RMP approved by Resources Regulator: Final Landform and Rehabilitation Plan (FLRP) and Rehabilitation Objectives (ROBJ) approved 8/12/2023.
Environmental Management Strategy	5/08/2022
MTW Historic Heritage Management Plan	12/08/2022
MTW Aboriginal Heritage Management Plan	12/08/2022
Wollombi Brook Aboriginal Cultural Heritage Conservation Area Plan of Management	16/06/2022
Loder Creek Aboriginal Cultural Heritage Conservation Area Plan of Management	19/03/2019
Management Plan for Goulburn River Biodiversity Area	12/08/2022
Management Plan for Bowditch Biodiversity Area	12/08/2022
Management Plan for Southern Biodiversity Area	12/08/2022
Management Plan for Northern Biodiversity Area	12/08/2022
Management Plan for North Rothbury Biodiversity Area	12/08/2022
Warkworth Sands Woodland Integrated Management Plan	Pending (Submitted to OEH 15/02/2017)
Warkworth Sands Woodland Performance Criteria	Pending (Submitted to OEH 15/02/2017)

4 OPERATIONS DURING THE REPORTING PERIOD

4.1 Summary of Mining Activities

Areas to be mined are geologically modelled, a mine plan is formed and the relevant mining locations are surveyed prior to mining. **Figure 4** illustrates the mining process.

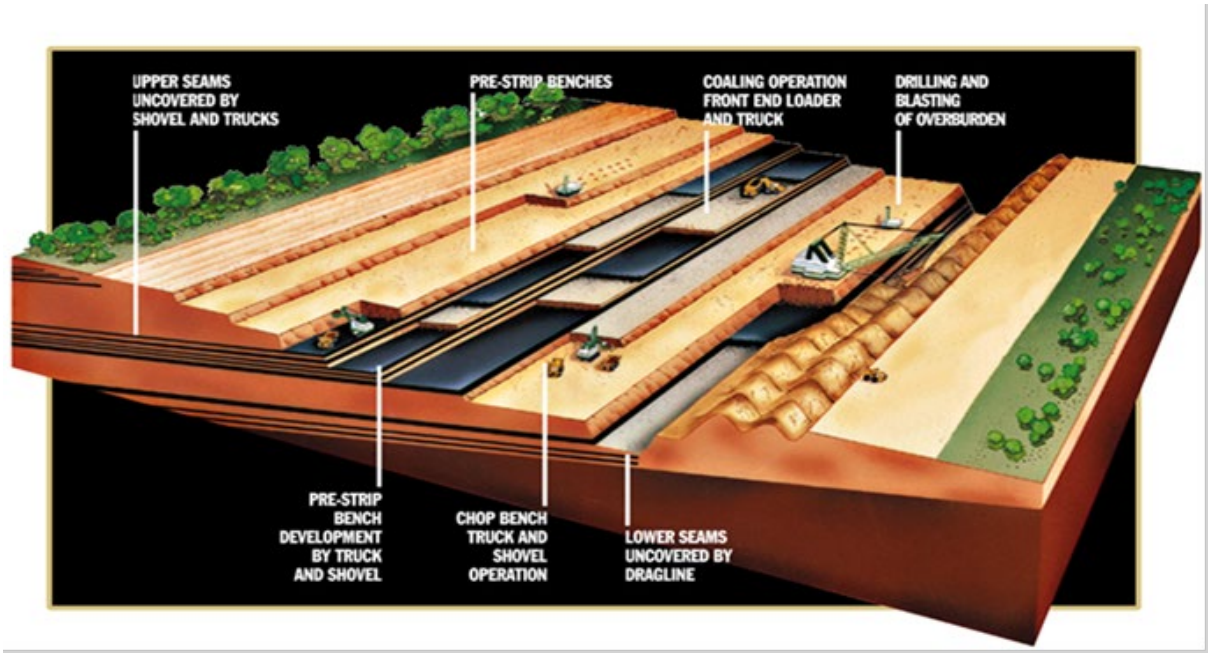


FIGURE 4: MINING PROCESS

Within Warkworth, mining activities continued to advance in a westerly direction in both North and West Pits; and the North Out of Pit (NOOP) Dam excavation by heavy mining equipment was completed during the reporting period and progressed to mechanical/electrical water infrastructure construction. North, West and South Pit voids were used for dumping overburden & coarse rejects from the North & South CHPP. Mount Thorley Operations continues to be utilised for fine tailings and overburden emplacement. Exploration drilling was conducted within the relevant mining leases ahead of mining and within the pit to gain further information on the resource. All mining related activity is in line with the current development consents.

4.1 Mineral Processing

All processing and rejects/tailings disposal activities undertaken in 2024 were consistent with the approved development consents and no changes were made to the processing and rejects/tailings disposal methods.

The Loders Pit Tailings Storage Facility commenced operating in 2021 and continued throughout 2024. The Centre Ramp & Abbey Green Tailings Storage Facilities were also used as alternative locations when required. Waste capping of Tailings Dam 2 continued throughout 2024 in limited quantities.

4.2 Production Statistics

MTW is permitted to extract up to 18 million tonnes of ROM coal from the Warkworth Mine and 10 million tonnes from the Mount Thorley Mine. MTW Production Statistics for the previous, current and future reporting period are summarised in **Table 4.1**.

TABLE 4.1 SUMMARY OF PRODUCTION AT MTW IN 2024

Material	Approved Limits	Reporting Period 2023	Reporting Period 2024	Forecast for 2025
Prime Overburden Waste (kbcm)	N/A	96,954	93,870	99,624
MTO ROM Coal (Mtpa)	10 (SSD-6465)	0.70	0.93	0.72
WML ROM Coal (Mtpa)	18 (SSD-6464)	16.53	16.31	16.78
Combined MTW ROM Coal (Mtpa)	28 (Combined)	17.23	17.24	17.50
Coarse Reject (kt)	N/A	5,179	4,865	4,894
Fine Reject – Tailings (kt)	N/A	575.5	540.5	543.8
Product (kt)	N/A	11,265	11,224	11,929

All product coal was transported by rail. MTW transported 11,289 kt of product coal via rail during the 2024 reporting period.

4.3 Summary of Changes (Developments and Equipment Upgrades)

- Warkworth's new Ultraclass Workshop, which was granted development consent by modification to SSD-6464 on 27 May 2022, received Construction Certificate on 8 December 2022. Significant progress with effluent management system installation and commissioning (after Singleton Council Approval), and workshop infrastructure was completed in February 2024.
- The North Out of Pit (NOOP) Dam excavation by heavy mining equipment was completed Q2 2024. Construction progressed to mechanical/electrical water infrastructure construction which will continue into 2025.
- Construction commenced of the final sediment water management structures and dams for the western advancing pre-strip at Warkworth. These structures were designed in accordance with the NSW Blue Book, Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries.
- Construction commenced for the designed increased discharge rate infrastructure for the MTO discharge point under the Hunter River Salinity Trade Scheme. The increased discharge rate is per the MTO development consent SSD-6465.
- The following new heavy mining equipment was commissioned in 2024:
    - Five Dozers
    - Five Water Trucks
    - One Small Wheel Loader
- The following heavy mining equipment was decommissioned in 2024:
    - Five Dozers
    - Two Water Trucks
    - One Haul Truck
    - One Excavator
    - One Small Wheel Loader
    - Two Drills

5 ACTION(S) REQUIRED FROM PREVIOUS ENVIRONMENTAL MANAGEMENT REVIEW

DPHI requested the following additional information in future AR reports:

- an image which provides regional context for the location of the Mt Thorley Warkworth mine. This image should ideally show the location of the mine in relation to nearby population centres and the Port of Newcastle. Completed - Refer to **Figure 1** of this AR.

6 ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

6.1 Meteorological Data

Meteorological data is collected to assist in day to day operational decisions, planning, and environmental management and to meet development consent requirements. MTW operates a meteorological (weather) station located on Charlton Ridge. The meteorological station measures wind speed, wind direction, temperature, humidity, solar radiation, rainfall, and sigma theta. Instruments are installed, calibrated, and maintained according to the relevant Australian Standard AS 3580.14 (2014). Meteorological data is available to site personnel and provides mining operations with trend assessment details to inform operational decisions aimed at minimising impacts. Daily Meteorological data summaries are presented in the Monthly Environmental Monitoring reports, available via the MTW website: https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mon-docs.

6.2 Noise

6.2.1 Noise Management

MTW manages noise with the aim to ensure compliance with permissible noise limits at nearby private residences. A combination of both proactive and reactive control mechanisms is employed on a continuous basis to ensure effective management of noise emissions is maintained. Noise management strategies and processes employed at MTW are detailed in the MTW Noise Management Plan available via the MTW website: https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mon-docs.

MTW's 2024 noise performance metrics are shown below:

- There were three non-compliances recorded against MTW's consented noise limits in relation to WML on 1 February 2024 (1dB), 22 April 2024 (1dB), and 7 May 2024 (2dB), all of which were caused after application of a low-frequency modifying factor of +2dB. In May 2024, MTW finalised the training and implementation of new handheld noise monitors and a post processing application (developed over 2023-2024) to allow supplementary noise readings undertaken by MTW personnel, to have the capability to identify noise parameters which can be used for low frequency noise assessment. Since May 2024, the supplementary noise readings undertaken by MTW personnel can assess for low frequency modifying factors. Since the implementation of the new monitoring equipment there were no further exceedances recorded in 2024. DPHI assessed the noise exceedances, and measures to prevent reoccurrence, and elected to issue a Warning Letter in response.
- Community noise complaints received – increased from 35 in 2023 to 45 in 2024.
- Number of Community Response Officer (CRO) (supplementary) noise measurements which exceed the internal trigger level for action increased from 143 in 2023 to 160 in 2024.
- Number of equipment downtime hours logged in response to noise management triggers – Increase from 3,201 hours in 2023 to 3,835 hours in 2024.

A range of noise management processes were undertaken during 2024. These are described herein.

6.2.2 Sound Power Control

During the reporting period, 66 sound power level assessments were undertaken by an external consultant across 31 trucks, 1 excavator, 15 track dozers, 3 drills, 1 loader, and 16 ancillary equipment items (rubber tyre dozer, scraper, water truck, fuel/lube truck, grader, small excavator). Of the assessments undertaken, 34 pieces of equipment exceeded MTW In-Service targets and as such are subject to further maintenance inspections/defect management to address sound power and to be retested as required.

6.2.2.1 Real Time Noise Management

MTW's Real-Time noise management framework provides an effective tool for managing instances of elevated noise, ensuring compliance is maintained, and responding to community concerns.

MTW utilise CROs to provide an interface between the mine and community. They are effective in implementing the management framework, validating real-time alerts through supplementary handheld noise measurements and audible observations, driving operational change as required and responding to community complaints. A summary of supplementary handheld noise measurements conducted by the CROs in 2024 is presented in **Table 6.1**.

MTW's Insite website allows members of the general public to access noise, meteorological, air quality data as well as any operational changes made during shift via MTW's interactive website. Insite viewer access: http://insite.yancoal.com.au

TABLE 6.1 SUMMARY OF SUPPLEMENTARY ATTENDED NOISE MONITORING CONDUCTED BY COMMUNITY RESPONSE OFFICERS 2024

Monitoring Location	Number of Assessments	Number of measurements >WML trigger^	Number of measurements > MTO trigger^	Average WML noise level ($L_{Aeq\ 5min}$ dB(A))*	Average MTO noise level ($L_{Aeq\ 5min}$ dB(A))*
Wollemi Peak Road (Bulga RFS)	1371	68	11	33.9	33.0
Bulga Village	547	8	0	33.3	31.8
Inlet Road	489	31	0	33.9	32.0
Inlet Road West	388	8	0	31.2	29.5
Long Point	545	1	0	30.6	28.5
South Bulga	-	-	-	-	-
Wambo Road	718	33	0	34.2	32.4
Total	4058	149	11	-	-

^Triggers are internally set thresholds for operational response and are specified in the MTW Noise Management Plan. The number of measurements greater than the trigger cannot be used as an assessment or interpretation of compliance. A compliance assessment is provided in Sections 1 and 6.2.3.1.

**Average noise levels do not take account of measurements taken where the noise source of interest was recorded as inaudible.*

[1] noise measurement taken where inaudible for MTO and noise level not assigned.

In response to the events listed in **Table 6.1** which were greater than the trigger, up to 3835 hours of equipment downtime were recorded to manage noise during 2024.

6.2.3 Noise Performance

A total of 100 compliance measurements were undertaken by an independent acoustic specialist in accordance with the MTW Noise Monitoring Programme during the reporting period. Each measurement involves an assessment of mine noise against the various LAeq, 15 minute and LA1, 1min noise criteria. Noise monitoring results are shown in **Appendix 1** and are also presented in the Monthly Environmental Monitoring Reports, available via the MTW website https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mon-docs

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfI), the applicability of the low frequency modification penalty has been assessed. There were six noise measurements taken during the reporting period which required the modifying factor penalty to be applied. Of those, there were three noise measurements taken during the reporting period which exceeded consent conditions following application of NPfI low frequency modifying factor, as listed in **TABLE 6.2**.

TABLE 6.2 ATTENDED NOISE MEASUREMENTS EXCEEDING CONSENT CONDITIONS FOLLOWING APPLICATION OF NPFI LOW FREQUENCY MODIFYING FACTOR

Location	Date/Time	Relevant Criteria	Criterion (dB)*	L_{Aeq}(dB)	Revised L_{Aeq} (dB)	Exceeds by (dB)
Inlet Road	1/02/2024 21:50	WML LAeq impact assessment criteria	37	36	38	1
Inlet Road	22/04/2024 21:28	WML LAeq impact assessment criteria	37	36	38	1
Inlet Road	7/05/2024 21:25	WML LAeq impact assessment criteria	37	37	39	2

The three non-compliances recorded against WML's consented noise limits (1 February 2024 (1dB), 22 April 2024 (1dB), and 5 July 2024 (2dB)), were caused after application of a low-frequency modifying factor of +2dB. In May 2024, MTW finalised the training and implementation of new handheld noise monitors and a post processing application (developed over 2023-2024) to allow supplementary noise readings undertaken by MTW personnel, to have the capability to identify noise parameters which can be used for low frequency noise assessment. Since May 2024, the supplementary noise readings undertaken by MTW personnel can assess for low frequency modifying factors. Since the implementation of the new monitoring equipment there were no further exceedances recorded in 2024. DPHI assessed the noise exceedances, and measures to prevent reoccurrence, and elected to issue a Warning Letter in response. The noise exceedances were reported to DPHI as incidents. Further detail on those reportable incidents is provided in **Section 10**.

6.2.3.1 Comparison against Last Years' Results

A comparison of non-compliances and exceedances between years is used as a measure of the effectiveness of noise management measures employed on site.

Details of this comparison are provided in **Table 6.3** which includes the low frequency modifying factor related noise exceedances recorded in 2024, compared to performance since 2014.

TABLE 6.3 COMPARISON OF 2024 NOISE MONITORING RESULTS AGAINST PREVIOUS YEARS'

Year	Number of assessments	Number of exceedances	Number of non-compliances
2024	600	3	3
2023	576	0	0
2022	612	7	6
2021	576	0	0
2020	576	0	0
2019	588	1	0
2018	594	1	0
2017	576	0	0
2016	576	0	0
2015	665	0	0
2014	700	0	0
2013	456	11	7
2012	562	13	3
2011	572	11	4
2010	561	3	3
2009	569	10	4

A comparison of supplementary noise measurements undertaken during the previous and current reporting period is provided in **Table 6.4**. This data shows the considerable effort in undertaking supplementary noise measurements has continued in 2024, and average noise readings have been comparable.

TABLE 6.4 COMPARISON OF CRO (SUPPLEMENTARY) NOISE MEASUREMENT PERFORMANCE

Monitoring Location	Number of Assessments		Number of Measurements >WML Trigger^		Number of Measurements > MTO Trigger^		Average WML Noise Level ($L_{Aeq\ 5min}$ dB(A))*		Average MTO Noise Level ($L_{Aeq\ 5min}$ dB(A))*	
	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024
Wollemi Peak Road (Bulga RFS)	1468	1371	88	68	33	11	33.3	33.9	33.7	33.0
Bulga Village	510	547	3	8	0	0	32.9	33.3	32.3	31.8
Inlet Road	390	489	4	31	1	0	32.8	33.9	31.6	32.0
Inlet Road West	357	388	1	8	0	0	30.6	31.2	29.4	29.5
Long Point	536	545	0	1	-[1]	0	30.6	30.6	-[1]	28.5
South Bulga	0	-	-	-	-	-	-	-	-	-
Wambo Road	622	718	13	33	0	0	33.4	34.2	32.3	32.4
Total	3884	4058	109	149	34	11	-	-	-	-

^Triggers are internally set thresholds for operational response and are specified in the MTW Noise Management Plan. The number of measurements greater than the trigger cannot be used an assessment or interpretation of compliance. Compliance assessment is provided in 6.2.3 and 6.2.4.

**Average noise levels do not take account of measurements taken where the noise source of interest was recorded as inaudible.*

[1] noise measurement taken were inaudible for MTO and noise level not assigned.

6.2.3.2 Validation of Real Time Monitoring Results

A comparison of real time and independent attended noise monitoring results was undertaken for 2024. The comparison identified that the majority of attended noise monitoring results were aligned or lower than the corresponding real time noise monitoring results i.e. real time noise monitor trigger is largely conservative for the most closely located real time noise monitors and for the mostly closely aligned 15-minute monitoring periods. There were exceptions to this, including;

- WML $L_{Aeq\ 15\ minute}$ attended monitoring measured noise levels were higher than the real time monitoring measured noise levels for five of eight monitoring locations in May; for four of eight monitoring locations in December; for three of eight monitoring locations in February, March, April, June, and August; and for one of eight monitoring locations in September.
- MTO $L_{Aeq,\ 15\ minute}$ attended monitoring measured noise levels were higher than the real time monitoring measured noise levels for two of eight attended monitoring locations in February, March, June, August, and December.

On the occasions where the WML and MTO attended monitoring measured noise levels were higher, the recorded noise levels were generally well below noise limits specified in MTW's Noise Management Plan.

The real time noise monitors can have difficulty assigning WML and MTO directional noise levels at times, such as where there is more than one noise source and where MTW is not the primary noise source. MTW's noise management process is that routine supplementary noise monitoring is also undertaken by the Community Response Officer each night and provides additional assessment of directional noise levels, allowing for swift targeted operational modifications where noise levels from MTW present a risk of exceeding the specified noise limit(s).

6.2.3.3 Comparison against EIS Predictions

Table 6.5 provides a comparison of 2024 attended monitoring data and the predicted noise levels modelled in the 2014 Warkworth Continuation EIS. Comparison has been made against the modelled worst-case noise levels for Year 9 of the development (nominally 2023). The comparison data has been sourced from the modelled noise levels at the nearest residential receivers to the current monitoring locations. Reported 2024 data is the calculated quarterly average of WML contribution to measured $L_{Aeq,\ 15\ minute}$ results and the maximum monthly measured noise level obtained through compliance assessment (irrespective of applicability of noise criteria due to meteorological conditions).

Where a monitoring event has been assessed as being "inaudible" or "not measurable", a conservative value of 25dB has been used to calculate the $L_{Aeq,\ 15\ minute}$ average for the quarter. The comparison shows that average measured $L_{Aeq,\ 15\ minute}$ noise is within the predicted EIS noise level range. Maximum measured $L_{Aeq,\ 15\ minute}$ noise was also within the predicted EIS noise level.

TABLE 6.5 PREDICTED NIGHT TIME WML (EIS 2014) LAEQ (15 MINUTE) NOISE LEVELS AND AVERAGED AND MAXIMUM 2024 MONITORING RESULTS

Monitoring Location	Year 9 Modelled Noise	Quarter 1 2024 average & maximum		Quarter 2 2024 average & maximum		Quarter 3 2024 average & maximum		Quarter 4 2024 average & maximum	
	$L_{Aeq\ (15\ minute)}$ (dB)	$L_{Aeq\ (15\ minute)}$ (dB)		$L_{Aeq\ (15\ minute)}$ (dB)		$L_{Aeq\ (15\ minute)}$ (dB)		$L_{Aeq\ (15\ minute)}$ (dB)	
		Avg	Max	Avg	Max	Avg	Max	Avg	Max
Wollemi Peak Road*/Bulga RFS	≤38	28.3	30	29.3	33	26.7	30	27	30
Bulga Village	≤38	30.3	33	25.3	26	26.0	33	28	34
Gouldsville Road	≤35	26.7	30	32.7	33	27.3	33	27	30
Inlet Road	≤37	29.4	38	34.6	39	28.7	36	28	34
Inlet Road West*	≤35	30.3	35	29.6	35	26.7	30	28	33
Long Point*	≤35	25.0	25	23.3	25	24.0	27	25	25
South Bulga	≤38	25.0	25	26.7	30	25.0	25	25	25
Wambo Road	≤38	29.0	34	33.0	38	27.7	33	26	34

**Denotes – No nearby receiver location modelled*

6.3 Blasting

6.3.1 Blast Management

During the reporting period, the MTW blast monitoring network operated in accordance with AS2187.2-2006 to measure ground vibration and air blast overpressure of each event at a high sampling frequency. Monitors function as regulatory compliance instruments in accordance with the MTW Blast Monitoring Programme (appended to Blast Management Plan) and are located on (or in locations representative of) privately owned land. During 2024 monitors were located at:

- Abbey Green (Abbey Green Station, Putty Road, Glenridding);
- Bulga Village (Wambo Road, Bulga);
- Putty Road, Mount Thorley (known as MTIE)
- Wambo Road (Wambo Road, Bulga);
- Warkworth Village (former Warkworth Public School, Warkworth); and
- Wollemi Peak Road (intersection of Putty & Wollemi Peak Roads, Bulga).

These locations are shown in **Figure 5** below.

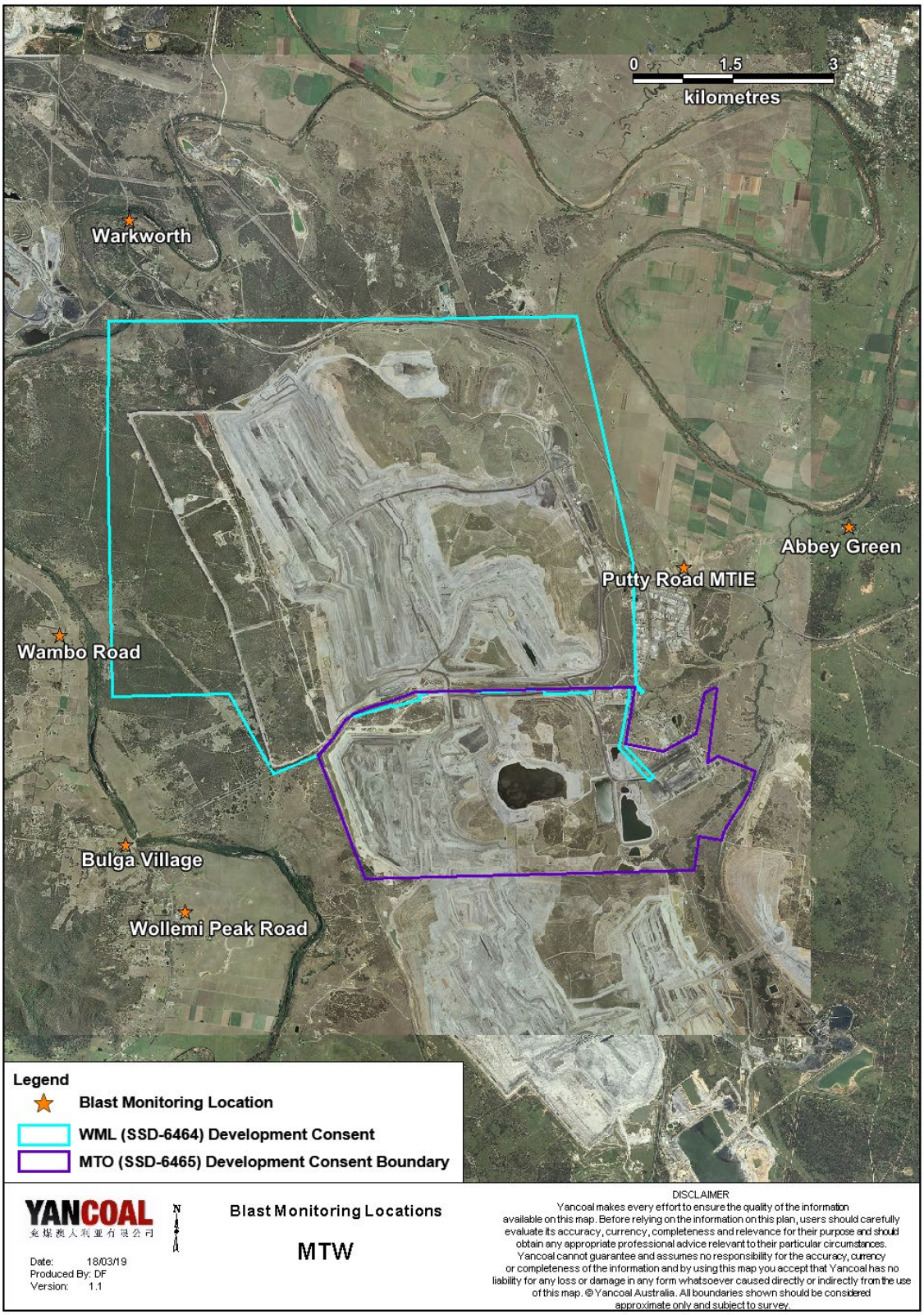


FIGURE 5: BLAST MONITORING LOCATIONS

6.3.2 Blast Performance

During the reporting period 260 blast events were initiated at MTW. Results of ground vibration and airblast overpressure recorded during 2024 are presented in **Figure 6** to **Figure 11**. All blasts returned results below the relevant ground vibration criteria for all monitoring locations. One (1) blast event on 20 June 2024 recorded an air blast overpressure result of 122.7 dB(L) at the Putty Rd MTIE monitoring location and an air blast overpressure result of 120.6 dB(L) at the Abbey Green monitoring location which were exceedances of the 120 dB(L) threshold for air blast overpressure at these monitoring locations.

A preliminary notification of the suspected airblast overpressure exceedance was reported to the DPHI and to the EPA on 20 June 2024. An investigation into this event was then commissioned and was ongoing when a written report was subsequently provided to the DPHI and to the EPA for this blast on 27 June 2024. The investigation concluded that the primary cause of this event was "directional wavefront reinforcement due to the effect of the front row delay sequence used" and to prevent recurrence, additional blast planning and design controls will be implemented for future blasts. An Official Caution was issued by the EPA in relation to this matter on 15 July 2024. The DPHI issued a Show Cause letter in relation to this matter on 22 July 2024 and a response was provided on 9 August 2024. The DPHI completed their investigation and issued a Warning Letter in relation to this event on 16 August 2024. Further details on this incident and the actions taken by MTW are provided in **Section 10.**

Road closures occurred for all blasts within 500 metres of a public road. Public roads were also closed on occasions to mitigate potential impact upon road users from post blast emissions.

In accordance with Schedule 3, Conditions 9 and 10 of SSD-6464, Warkworth Mining Limited carried out blasting on site between 7am and 5pm Monday to Saturday inclusive. No blasts occurred on Sundays or on public holidays. Warkworth Mining Limited carried out not more than 3 blasts per day and not more than 12 blasts per week (averaged over a calendar year).

No blasts were carried out at Mt Thorley Operations Limited in 2024.

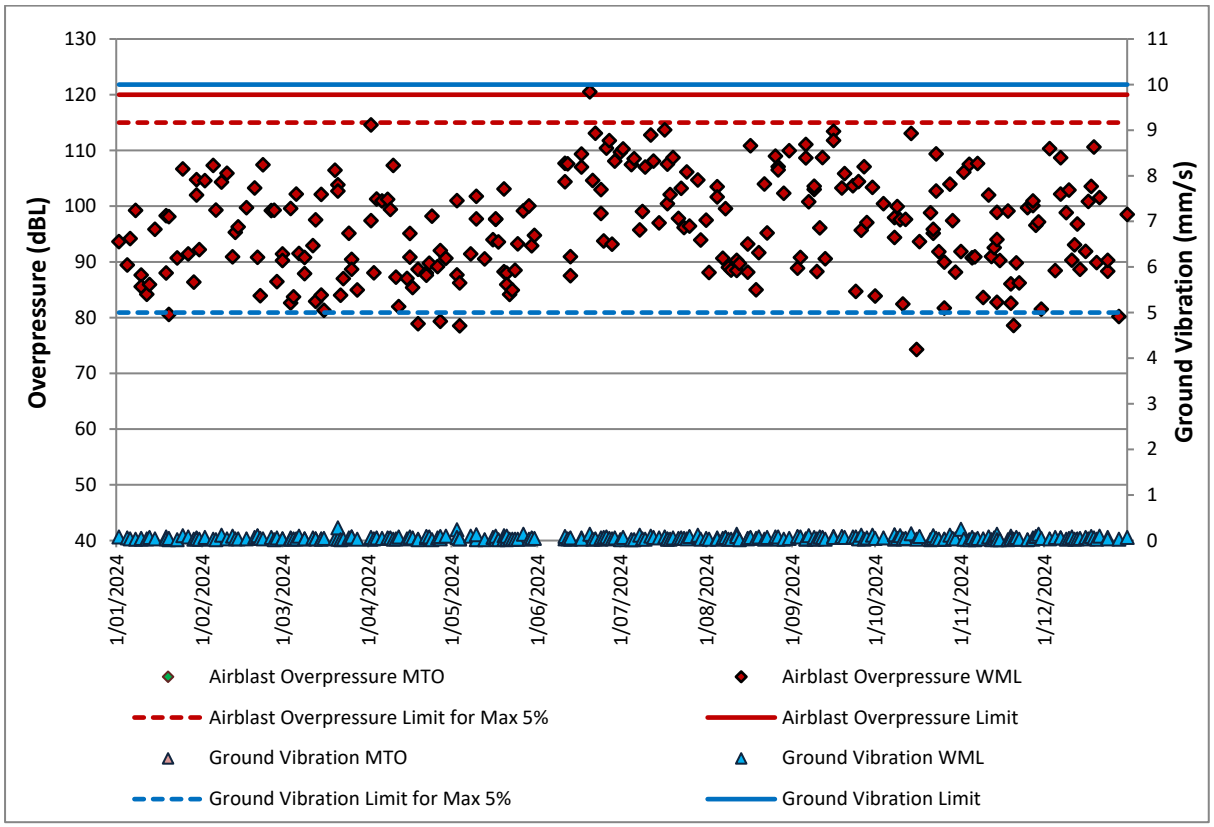


FIGURE 6: ABBEY GREEN BLAST RESULTS

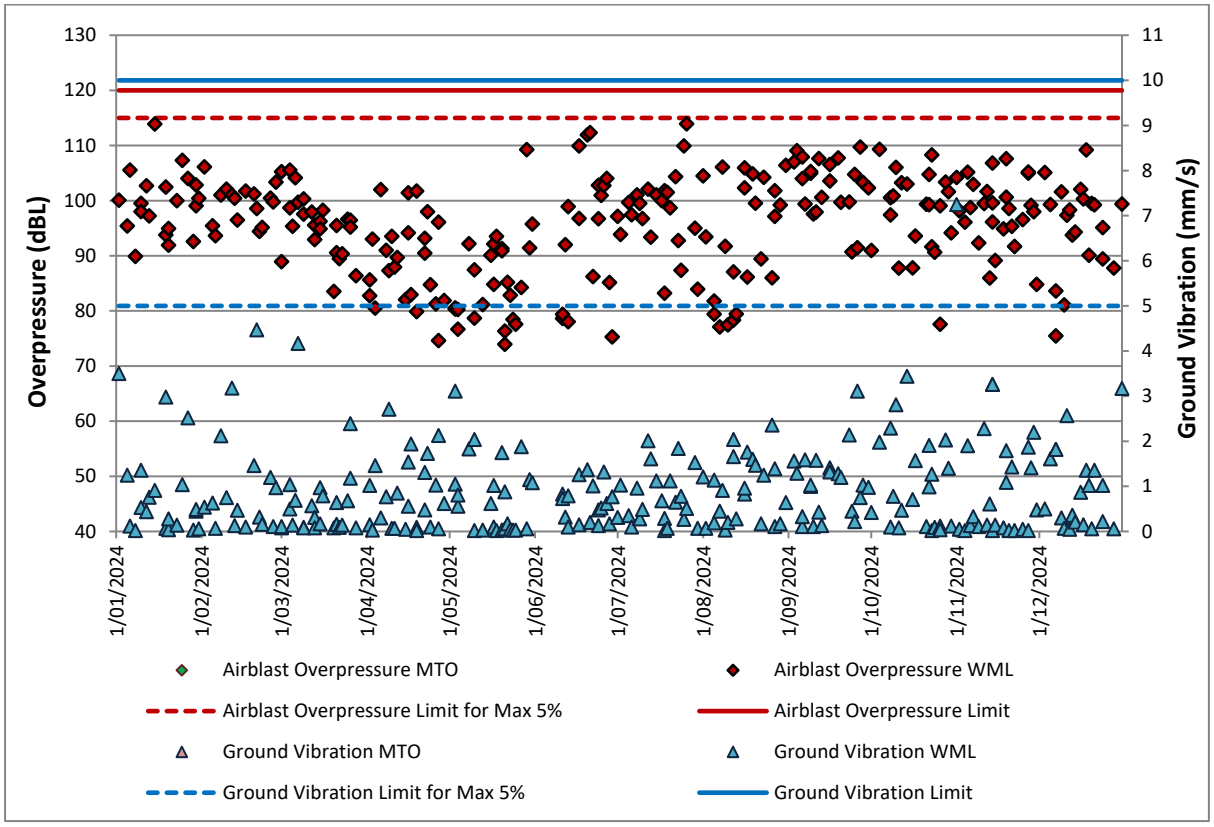


FIGURE 7: BULGA VILLAGE BLAST RESULTS

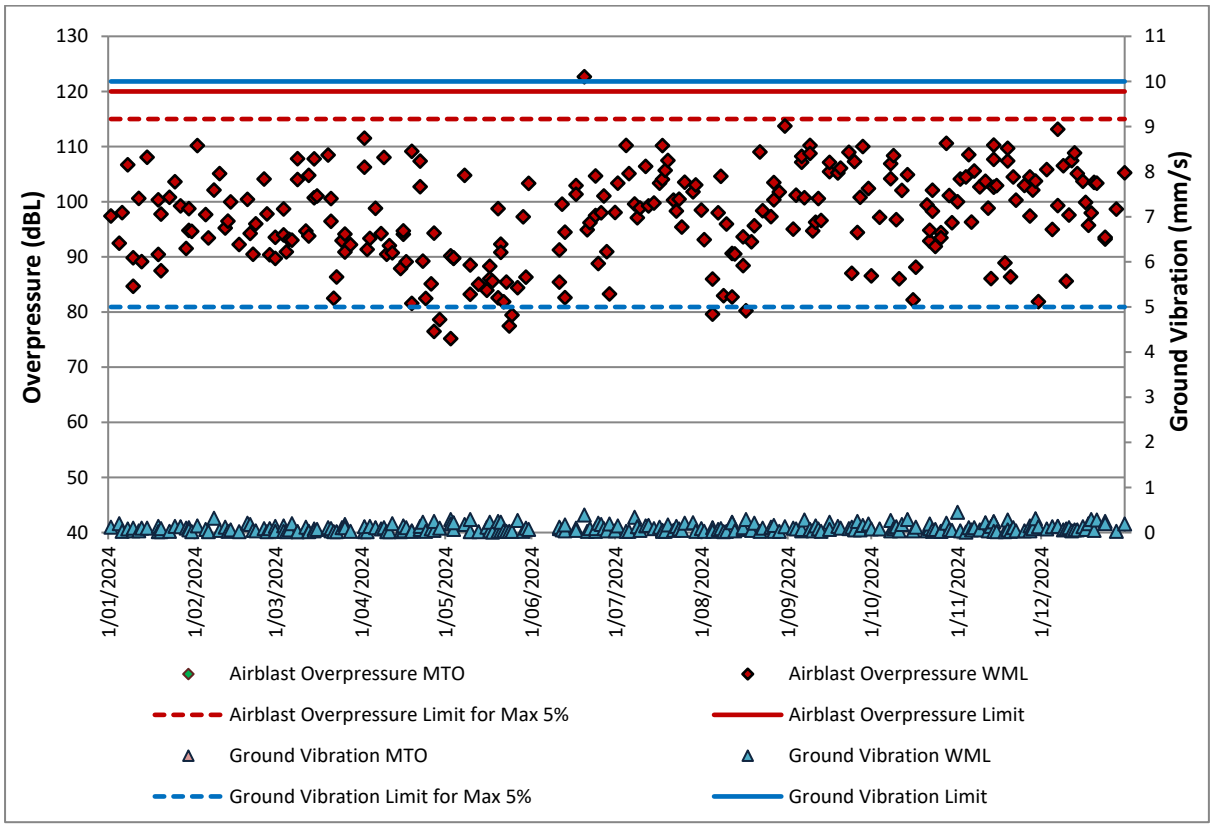


FIGURE 8: MTIE BLAST RESULTS

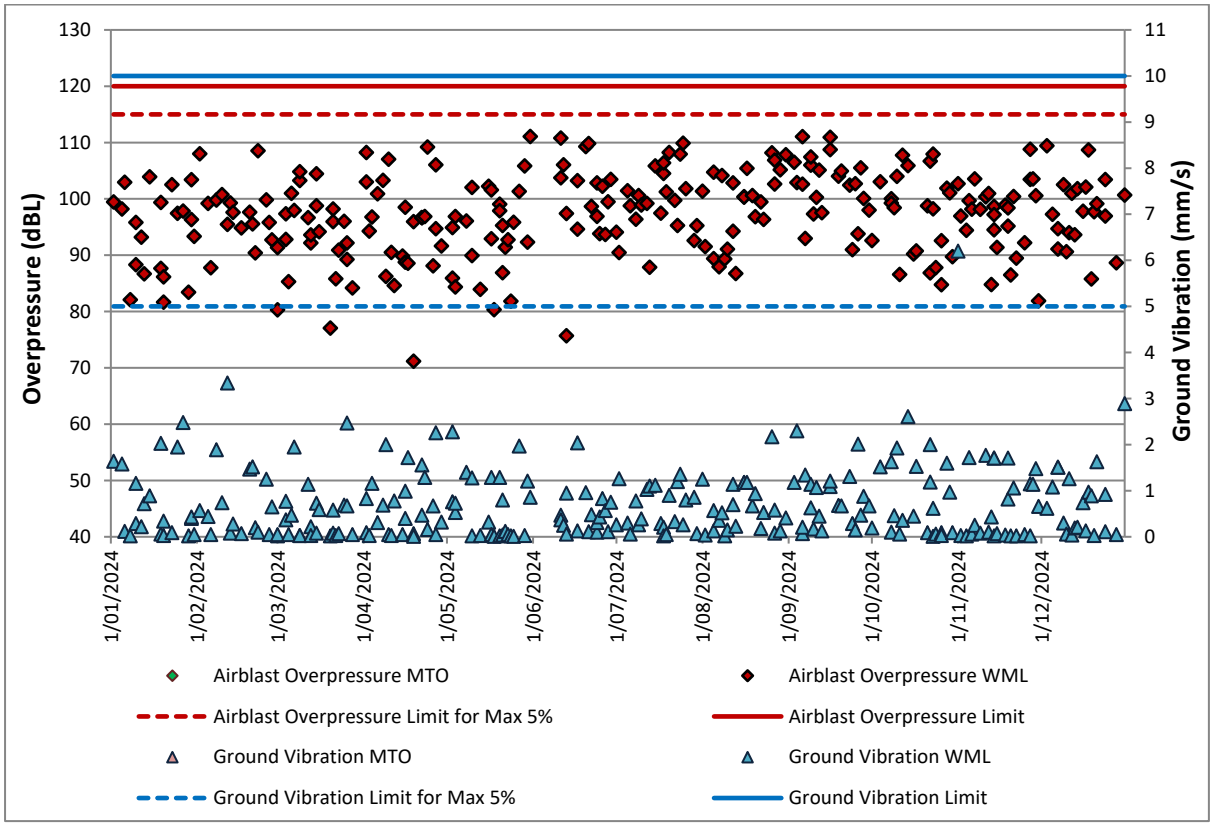


FIGURE 9: WOLLEMI PEAK ROAD BLAST RESULTS

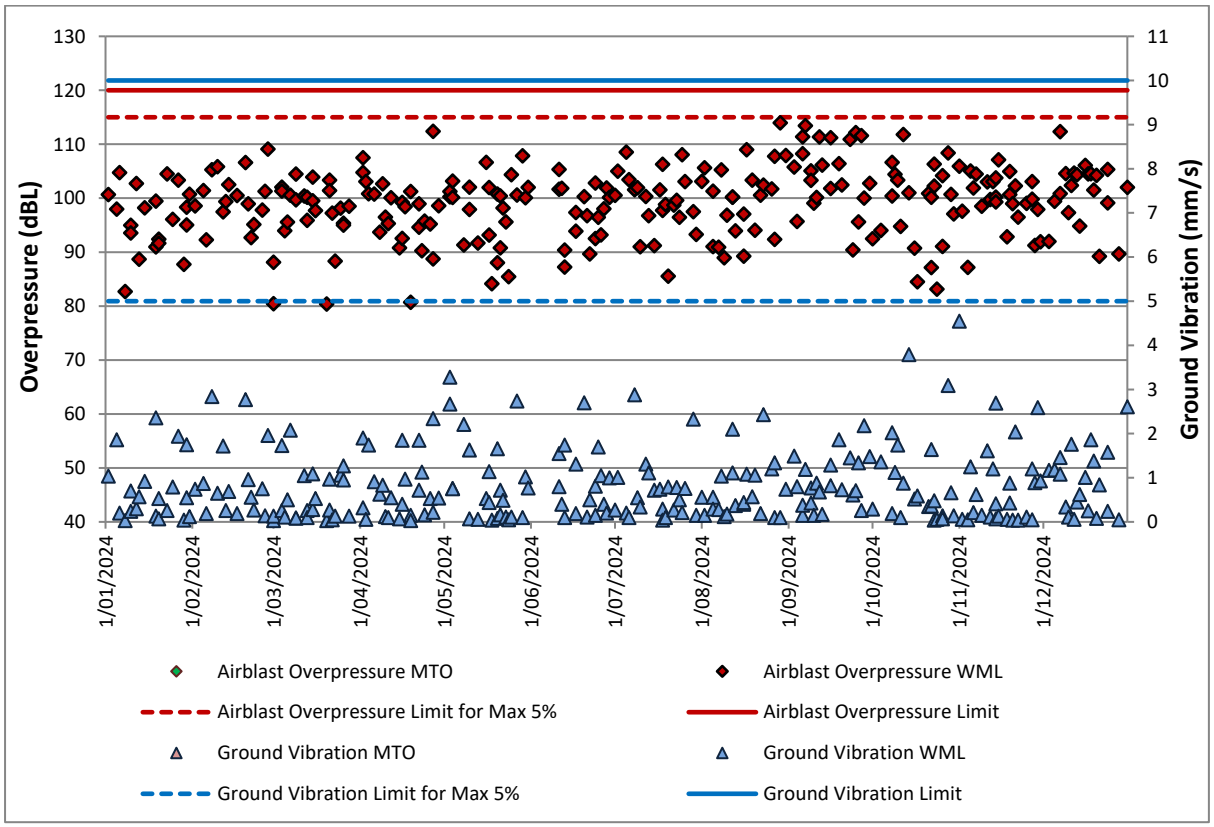


FIGURE 10: WAMBO ROAD BLAST RESULTS

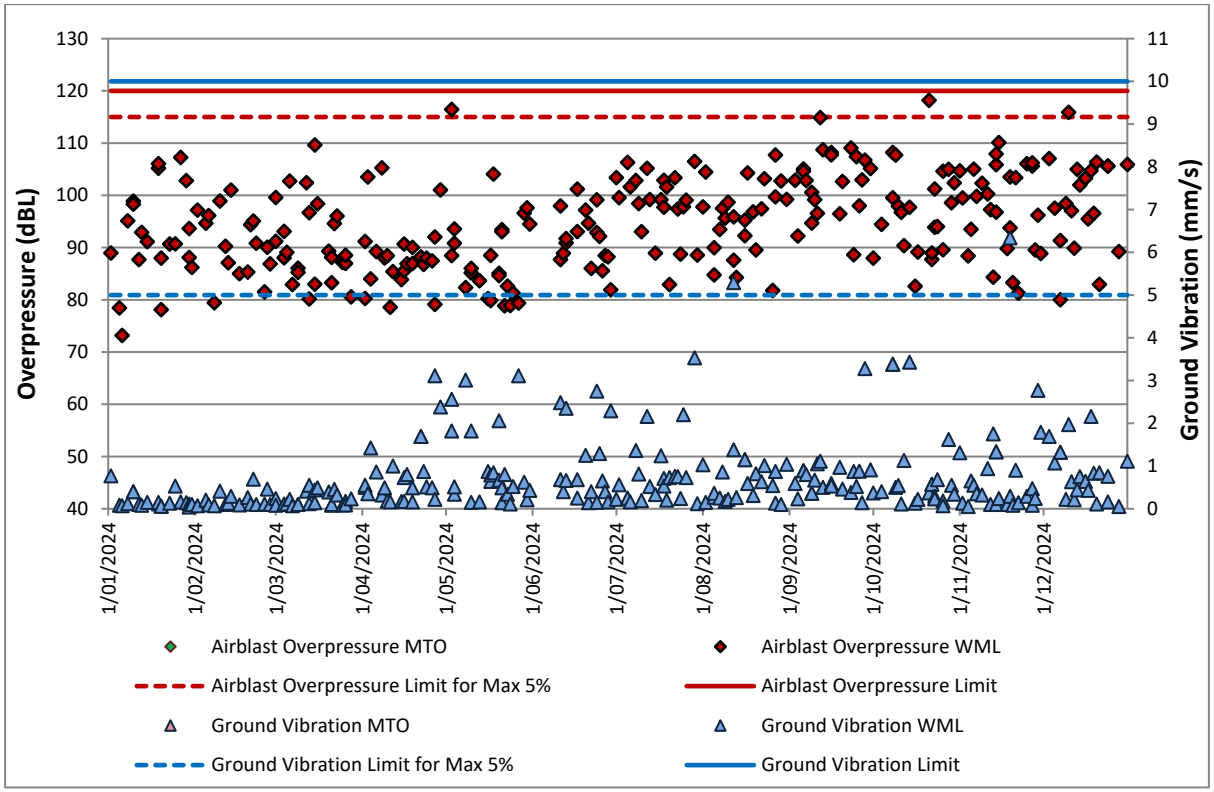


FIGURE 11: WARKWORTH BLAST RESULTS

6.3.2.1 Blast Fume Management

MTW operates a Post Blast Fume Generation Mitigation and Management Plan. This document outlines the practices to be utilised to reduce generation of post blast fume and reduce potential offsite impact from any fume which may be produced. This includes risk assessment of the likelihood of fume production, specialised blasting design, appropriate product selection, on-bench water management, implementation of fume management zones and use of blasting permissions to identify likely path of any fume which may be produced.

All blasts are observed for fume and any fume produced is ranked according to the Australian Explosive Industry & Safety Group (AEISG) Scale. During 2024, no blasts produced visible post-blast fume with a post-blast ranking Level 4 or higher according to the AEISG Scale.

Rankings for visible blast fume according to the AEISG scale for shots fired during 2024 and comparison to rankings distribution during previous years is provided in **Table 6.6.**

TABLE 6.6 VISIBLE BLAST FUME RANKINGS ACCORDING TO THE AEISG COLOUR SCALE

AEISG Ranking	2024	2023	2022
0	246	272	219
1	21	9	15
2	12	5	11
3	5	7	2
4	0	0	0
5	0	0	0
Total*	284	293	247

** Where a number of individual blasts were fired as a blast event, fume was assessed for each individual blast pattern rather than for the event as a whole.*

6.3.2.2 Comparison of Monitoring Results Against Previous Years' Performance and EA Predictions

Blasting results recorded in 2024 are similar to results recorded in previous years and are generally consistent with EA predictions.

6.4 Air Quality

6.4.1 Air Quality Management

Air quality management at MTW is prescribed by the Air Quality Management Plan (available at https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mgt-docs). The management plan:

- Describes procedures required to ensure compliance with the approval conditions relating to air quality including the measures that MTW will use to manage air quality;
- Details the management framework and mitigation actions to be taken while operating; and
- Provides a mechanism for assessing air quality monitoring results against the relevant impact assessment criteria.

6.4.1.1 Real-Time Air Quality Management

MTW's real-time air quality monitoring stations continuously log information and transmit data to a central database, generating alarms when particulate matter levels exceed internal trigger limits. Following an alarm, an inspection is undertaken, and operations and equipment usage are modified as required to manage air quality in accordance with MTW's Air Quality Management Plan.

934 real-time alarms for air quality and wind conditions were received and acknowledged during 2024 from the real-time monitors which are shown on the map in **Figure 14**. In response, up to 2,570 hours of mining equipment downtime was recorded due to air quality management. A detailed breakdown of air quality related equipment stoppages (per month, per equipment type) is presented in **Figure 12**.

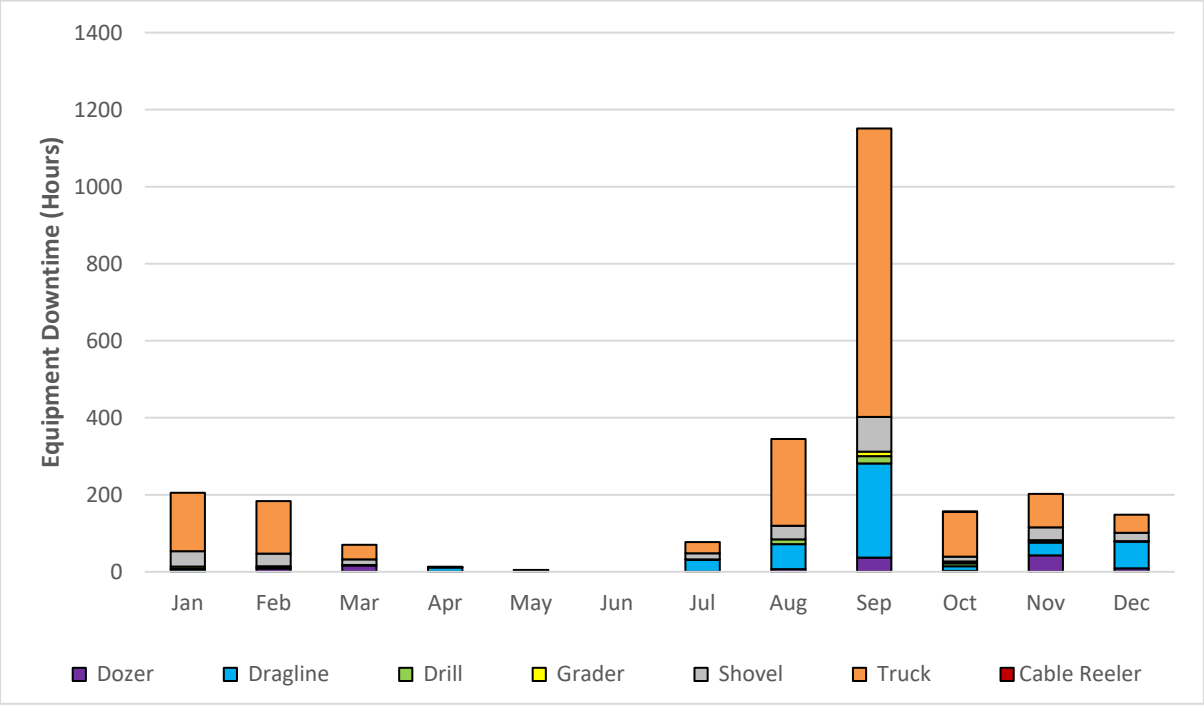


FIGURE 12: EQUIPMENT DOWNTIME FOR DUST MANAGEMENT BY MONTH (2024)

6.4.1.2 Temporary Stabilisation

An aerial seeding programme was undertaken in 2024, which aimed to reduce airborne dust from inactive waste dumps and ahead of mining areas. 151 hectares of area was seeded (see **Figure 13**) using an exotic pasture grass and legume mix suitable for summer sowing. Fertiliser was mixed with the seed prior to loading to provide sufficient nutrients for plant growth.



FIGURE 13: AERIAL SEEDING AREAS

6.4.2 Air Quality Performance

6.4.2.1 Air Quality Monitoring

Air quality monitoring at MTW is undertaken in accordance with the MTW Air Quality Monitoring Programme and protocol for evaluating non-compliances. The monitoring network comprises an extensive array of monitoring equipment which is utilised to assess performance against the relevant conditions of MTW's approvals and EPL's. Air quality monitoring locations are shown in **Figure 14**. During 2024, MTW complied with all short term and annual average air quality criteria.

Air quality compliance criteria are shown in **Table 6.7**, along with a summary of MTW's performance against the criteria. Whilst MTW operates under two separate planning approvals the following compliance assessment has been undertaken on a 'whole of MTW site' basis, rather than individually assessing the contribution of each approval area to the measured results.

Air quality monitoring data is made publicly available through the MTW Monthly Environmental Monitoring Reports available on the MTW website at: https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mon-docs and daily data can be accessed on the MTW Insite website at: https://insite.yancoal.com.au/mount-thorley-warkworth/data

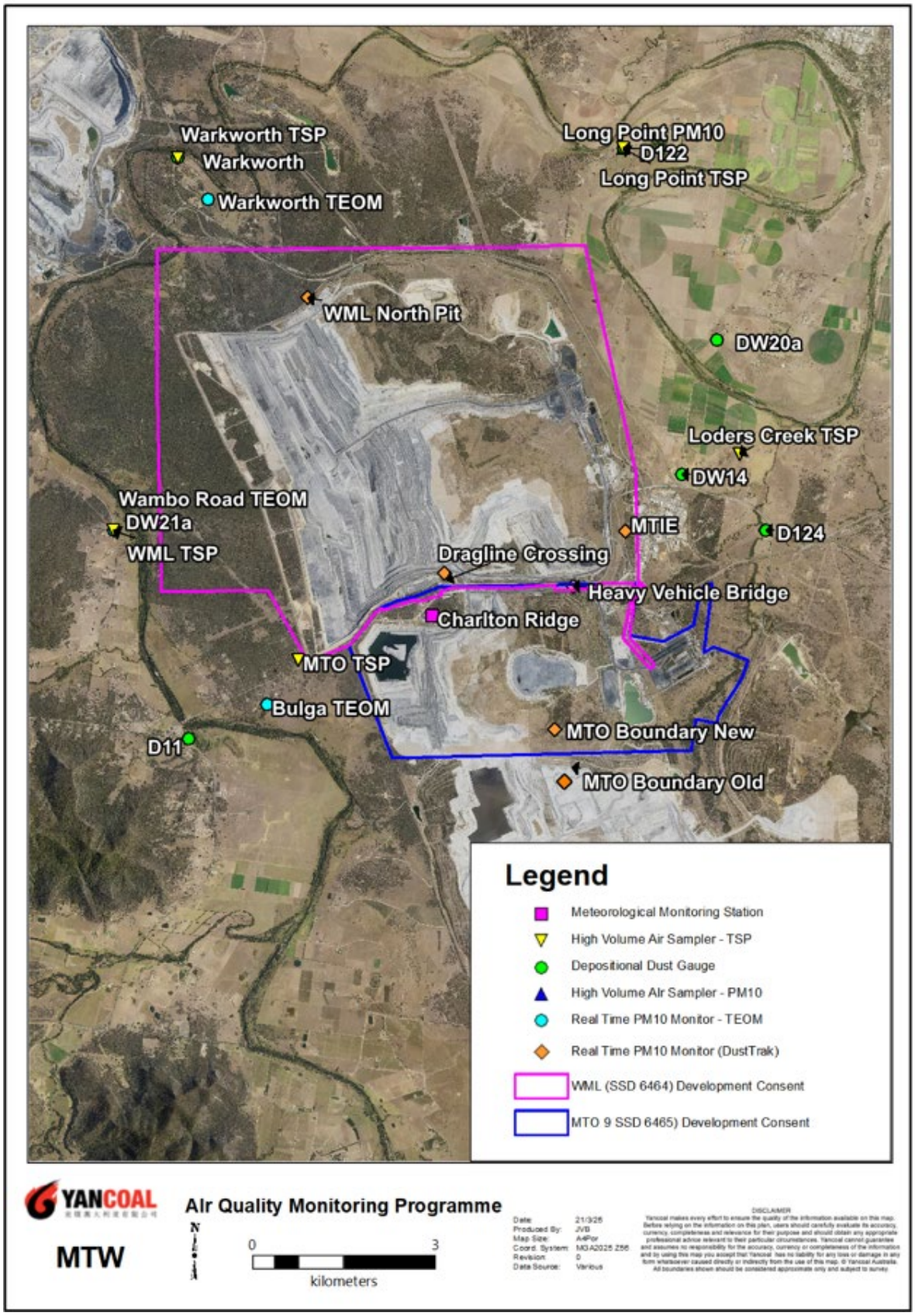


FIGURE 14: AIR AND METEOROLOGICAL MONITORING LOCATIONS MTW 2024

TABLE 6.7 AIR QUALITY IMPACT ASSESSMENT CRITERIA AND 2024 COMPLIANCE ASSESSMENT

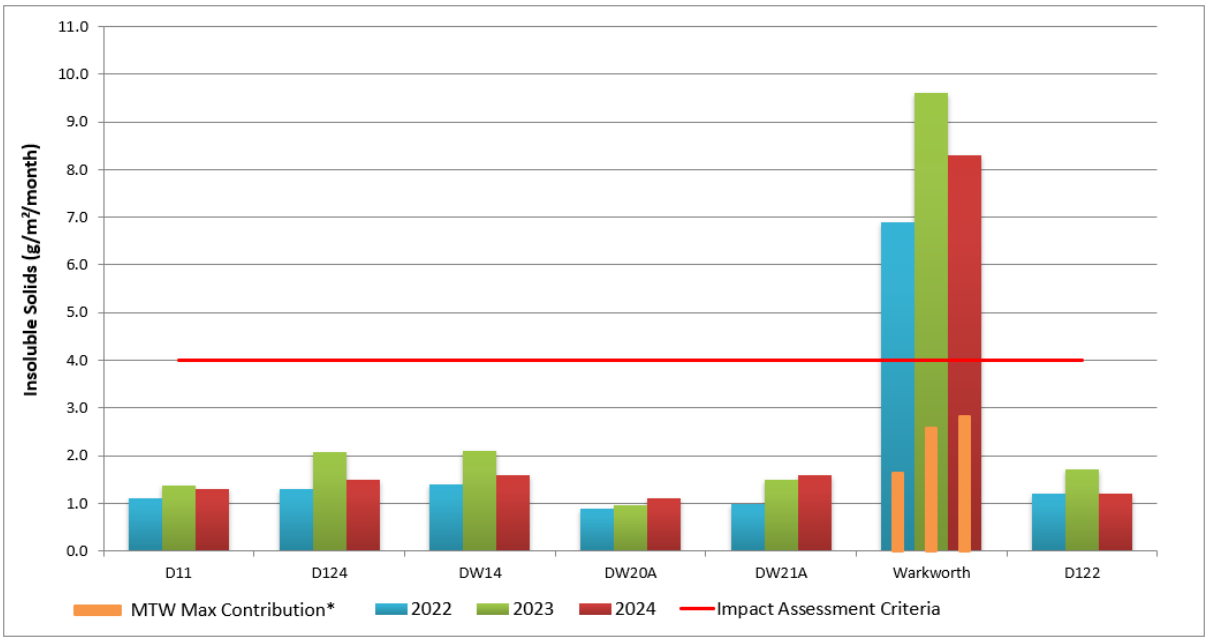
Pollutant	Criterion	Averaging Period	Compliance
Deposited Dust	4 g/m^2/month	Maximum total deposited dust level	100%
	2 g/m^2/month	Maximum increase in deposited dust level	100%
Total Suspended Particulate matter (TSP)	90 µg/m^3	Long Term (Annual)	100%
Particulate matter <10µm (PM_{10})	30 µg/m^3	Long Term (Annual)	100%
	50 µg/m^3	Short Term (24 hour)	100%

6.4.2.2 Deposited Dust

Deposited dust is monitored generally in accordance with AS3580.10.1(2016) at six (6) locations situated on, or representative of residences on privately-owned land and also at a 7th location (Warkworth). The Warkworth deposited dust gauge location differs from the other six dust gauge locations as there are no longer any residences on privately owned properties in Warkworth. The annual average insoluble matter deposition rates in 2024 compared with the impact assessment criterion and previous year's data is shown in **Figure 14.**

There was one exceedance of the 4 g/m^2/month long-term impact assessment criteria, for maximum total deposited dust level, recorded at the Warkworth monitoring location. An external consultant was engaged to conduct an investigation which determined maximum MTW contribution to be less than or equal to 2.8g/m2/month, or ~34% of the total level of 8.3g/m2/month at Warkworth. Whilst the result exceeds the 2 g/m^2/month maximum allowable increase in deposited dust criterion, there are no residences on privately-owned land in Warkworth and as such, this does not constitute non-compliance, as per Schedule 3, Condition 17 of Warkworth Mining Limited Development Consent (SSD-6464) and Schedule 3, Condition 15 of Mount Thorley Operations Development Consent (SSD-6465).

Excepting the Warkworth monitoring location for reasons above, all annual average insoluble matter deposition rates recorded on or representing privately owned land were compliant with the long-term impact assessment criteria of 4g/m2/month. MTW propose to amend its Air Quality Monitoring Programme to remove the Warkworth depositional dust gauge from its monitoring network, considering that there are no longer any residences on privately-owned land in Warkworth.



** MTW's estimated maximum contribution to annual average deposited dust level (determined by external air quality consultant).*

FIGURE 15: 2024 DEPOSITIONAL DUST RESULTS COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA AND PREVIOUS YEARS' RESULTS

6.4.2.3 Total Suspended Particulates (TSP)

Total Suspended Particulates (TSP) are measured at four (4) locations situated on or representative of privately-owned land in accordance with AS3580.9.3 (2015) and also at a 5th location (Warkworth HVAS). The Warkworth HVAS is not representative of privately-owned land as there are no residences on privately owned properties in Warkworth.

Annual average TSP concentrations recorded in 2024 compared against the long-term impact assessment criterion and previous years' data, are shown in **Figure 16**.

One high volume air sampler exceeded the annual TSP impact assessment criteria during the 2024 reporting period. This was investigated to determine the level of contribution from MTW activities in accordance with the compliance protocol outlined in the approved MTW Air Quality Management Plan. The recorded exceedance was determined to be compliant with the relevant criteria, as the measured result was not primarily attributable to MTW.

After analysis of the single exceedance, all annual average results were compliant with the impact assessment and land acquisition criteria.

A summary of the investigation undertaken for the annual TSP exceedance is provided in **Table 6.8**

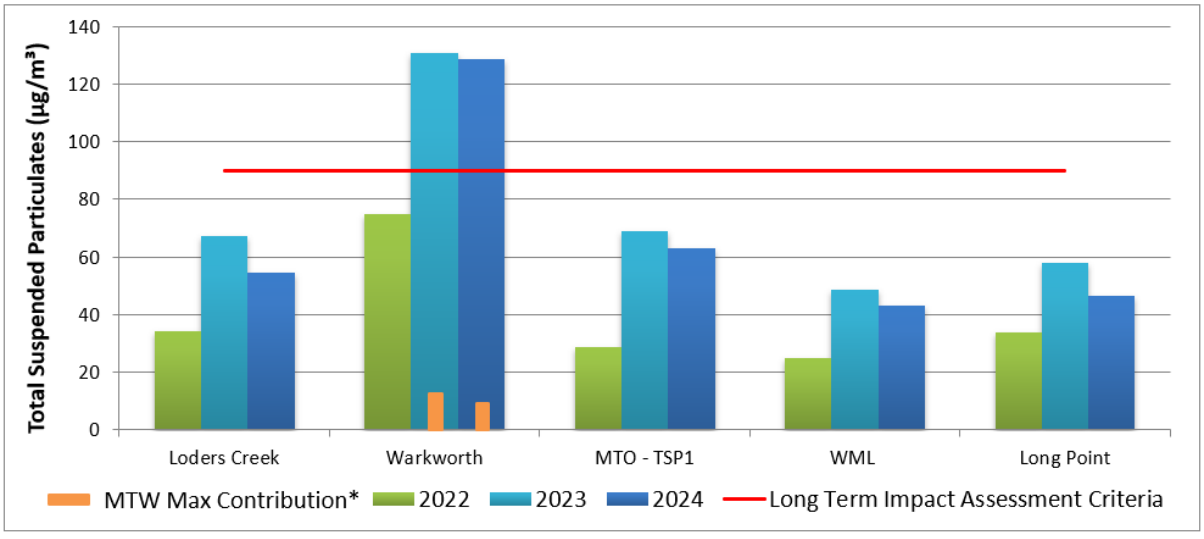
TABLE 6.8 ANNUAL TSP INVESTIGATION - 2024

Date	Site	Annual Average PM_{10} result ($\mu g/m^3$)	Calculated Annual TSP ($\mu g/m3$)	Discussion
2024	Warkworth HVAS TSP	128.6	≤10.0*	An external consultant was engaged to investigate the exceedance. The investigation determined that the maximum potential contribution from MTW at the Warkworth monitor during the review period was 10.0 µg/m3. This was based on an analysis of meteorological data, estimated background particulate levels and position of the site in relation to MTW. As the measured result is not primarily attributable to MTW, it does not constitute non-compliance, as per MTW's approved Air Quality Management Plan. No further action is required.

* *MTW's estimated contribution to annual average TSP level ($\mu g/m^3$).*

During the reporting period, two (2) out of the 305 TSP measurements were not able to be fully collected on the scheduled sampling date (based on a sampling frequency of every six days) due to an equipment issue and a contaminated sample.

The annual average TSP concentrations recorded in 2024 and 2023 were significantly higher than in 2022. This is likely related to below average rainfall in 2024 and 2023 as these years experienced significantly less rainfall than in 2022.



** MTW's estimated maximum contribution to annual average TSP level (determined by external air quality consultant).*

FIGURE 16: 2024 TSP ANNUAL AVERAGE COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA AND PREVIOUS YEARS' RESULTS

6.4.2.4 Particulate Matter <10µm (PM10)

Compliance assessment for Particulate Matter <10µm (PM_{10}) is measured at four (4) locations on privately owned land in accordance with AS3580.9.6 (2015). During 2024, all short term and annual average results were compliant with the impact assessment criteria, as per MTW's approved Air Quality Management Plan.

6.4.2.5 Short term PM10 impact assessment criteria

Monitoring results for PM_{10} (24 hour) collected through High-Volume Air Sampler monitoring are compared against the short-term impact assessment criteria (**Figure 17**). All 24hr average results recorded by MTW's surrounding network of TEOM monitors are presented on a quarterly basis in **Figure 18** to **Figure 21.**

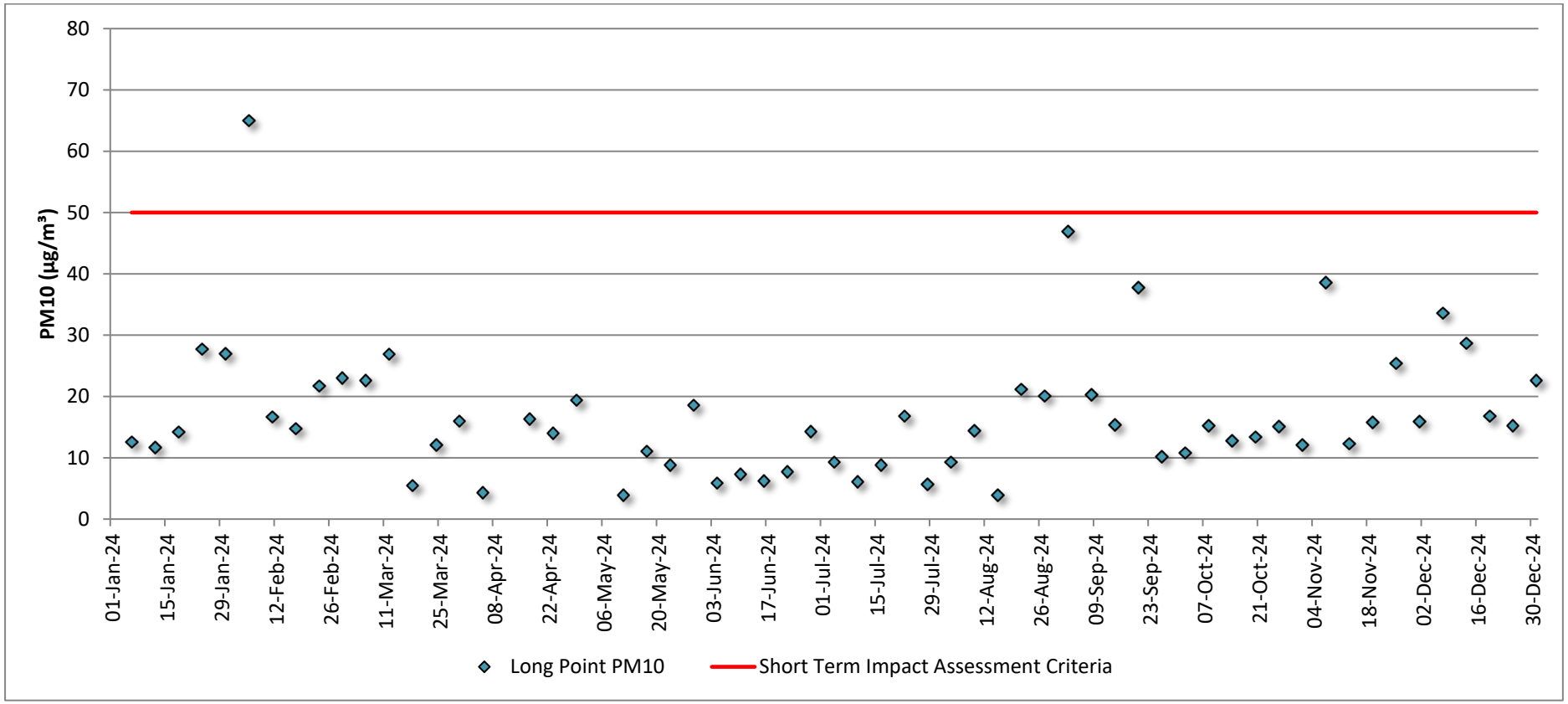


FIGURE 17: PM10 24HR MONITORING RESULTS (MEASURED BY MTW PM10 HVAS MONITOR)

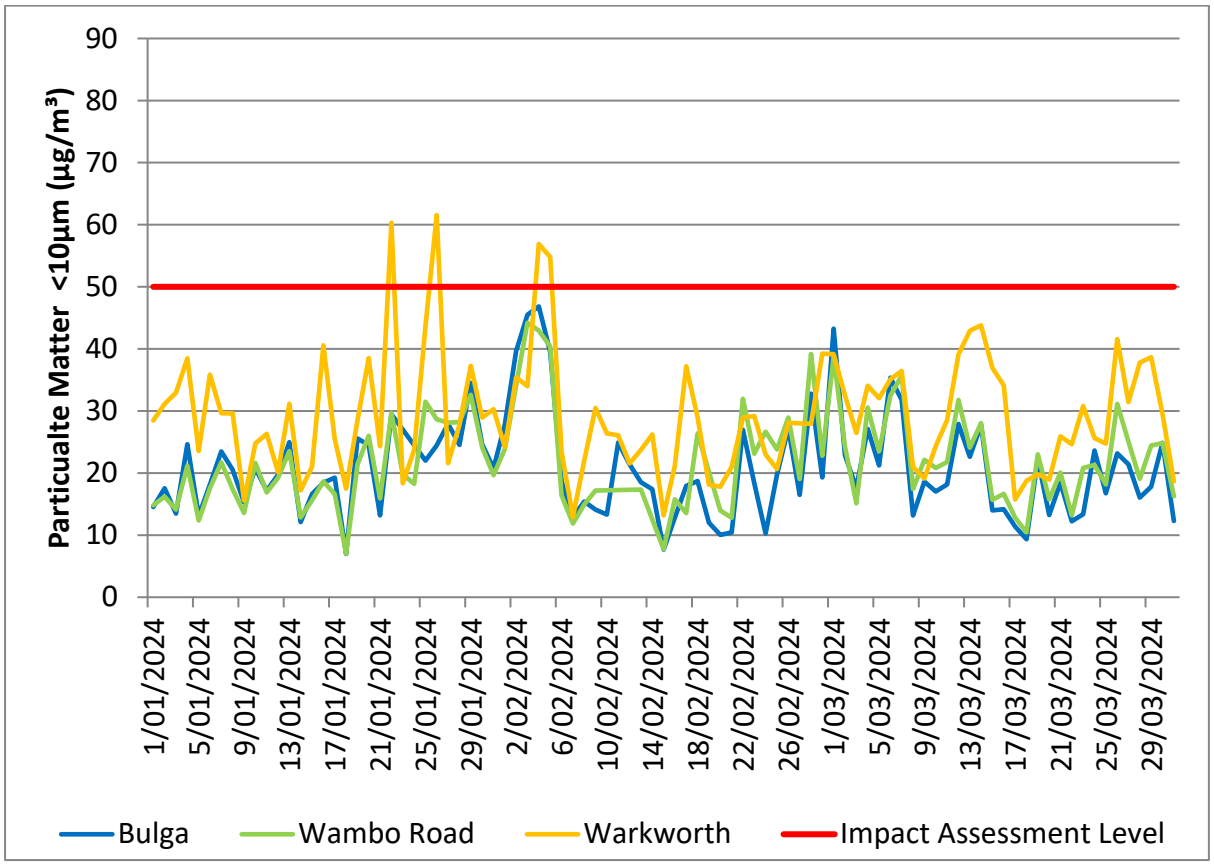


FIGURE 18: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER ONE 2024

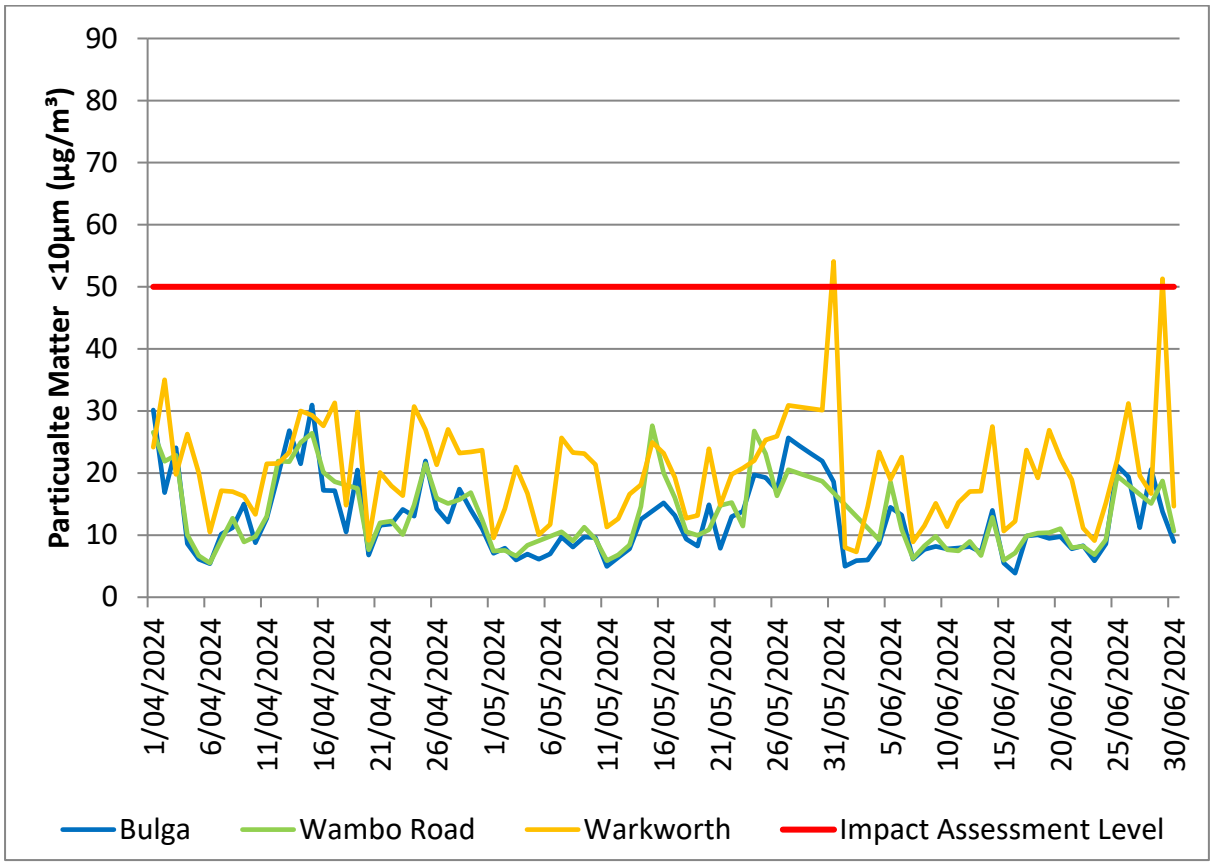


FIGURE 19: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER TWO 2024

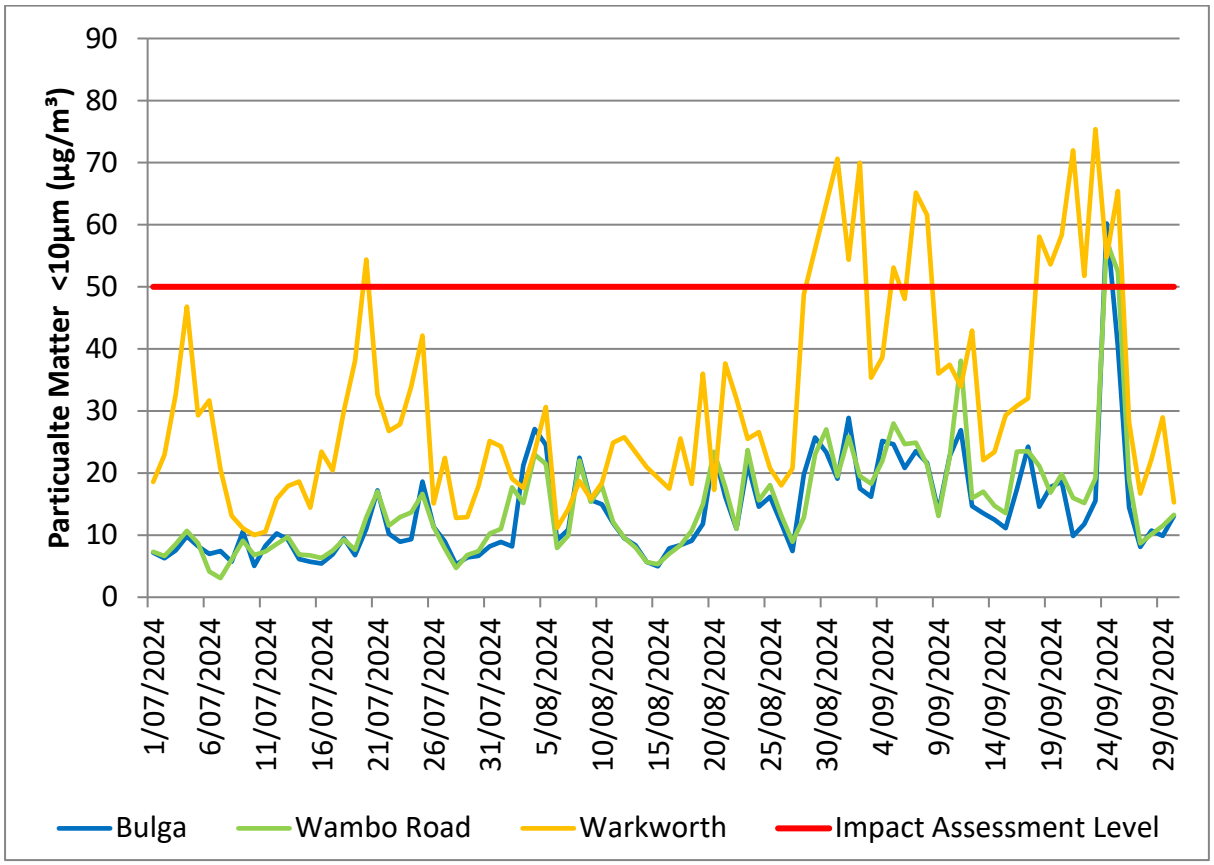


FIGURE 20: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER THREE 2024

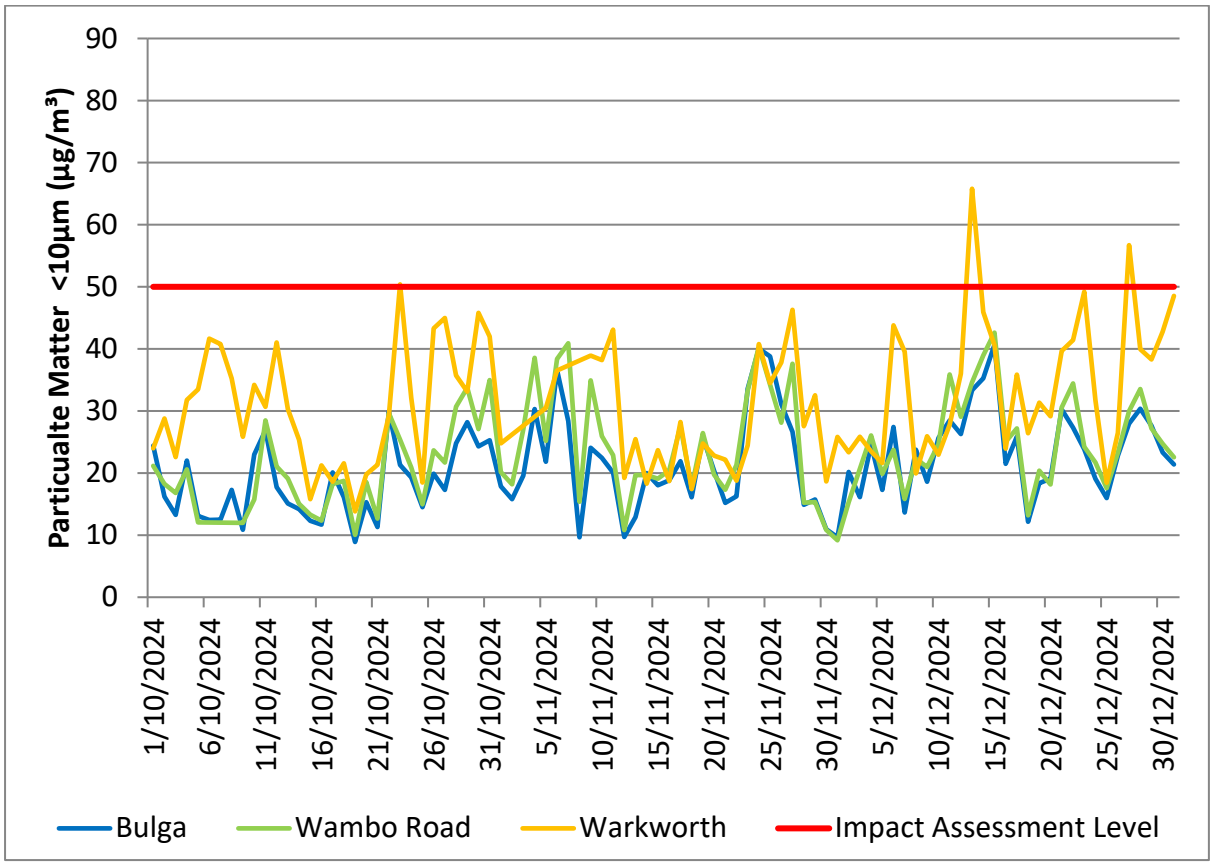


FIGURE 21: 24HR AVERAGE PM_{10} MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER FOUR 2024

Twenty-eight (28) TEOM PM_{10} raw measurement results and one (1) HVAS PM_{10} raw measurement result (all sources) exceeded the 24 hour short term impact assessment criteria during the reporting period. The exceedances were investigated to determine the level of contribution from MTW activities in accordance with the compliance protocol outlined in the MTW Air Quality Management Plan. This protocol considers wind direction to infer the source of particulate matter. A summary of the investigations undertaken for the short term PM10 exceedances is provided in **Appendix 2**. The investigations found that MTW was not a significant contributor to any of the 28 TEOM PM_{10} result exceedances or the one (1) HVAS PM_{10} result exceedance and therefore, no non-compliances were recorded.

6.4.2.6 Long term PM_{10} impact assessment criteria

Annual average PM_{10} concentrations have been compared with the long term PM_{10} impact assessment criterion and previous years' data in **Figure 22**. All annual average PM_{10} concentrations recorded on privately owned land (or representative of the nearest privately-owned property) were compliant with the assessment criterion.

The annual average PM_{10} concentrations recorded in 2024 and 2023 were significantly higher than in 2022. This is likely related to below average rainfall in 2024 and 2023 as these years both experienced significantly less rainfall than in 2022.

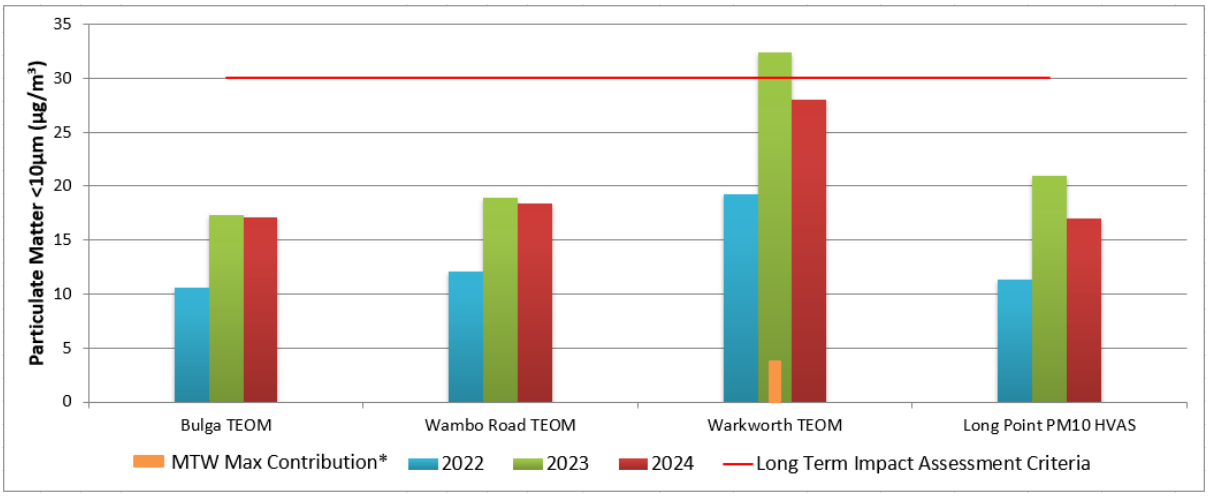


FIGURE 22: ANNUAL AVERAGE PM10 RESULTS 2022 TO 2024

6.4.2.7 Comparison of 2024 Air Quality data against EA predictions

Annual average PM_{10} results at two of four monitoring locations were above the modelled range for Year 9 of the development (nominally 2023). Refer to **Table 6.9**

TSP annual averages at all monitoring locations were higher than modelled predictions for the Year 9 scenario. Refer to **Table 6.10**.

The difference between modelled predictions and the measured results can be explained as a function of model inputs which do not account for PM10 or TSP contribution from regional particulate events such as bushfires, stock movement, dust from local roads and driveways and agricultural activity. The annual average TSP and PM_{10} concentrations recorded in 2024 and 2023 are higher than those recorded in 2022, shown in **Figure 16** and **Figure 22**, which is likely related to below average rainfall in 2024 and 2023 compared to above average rainfall in 2022.

TABLE 6.9 2024 PM10 ANNUAL AVERAGE RESULTS COMPARED AGAINST CUMULATIVE PREDICTIONS FOR YEAR 9 - WARKWORTH CONTINUATION EIS (2014).

Monitoring Location	Long Term (annual average) PM_{10} criteria	
	Year 9 EIS Prediction (µg/m³)	2024 Annual Average (µg/m³)
Bulga OEH TEOM	22	17.1
Wambo Road TEOM	14	18.4
Warkworth OEH TEOM	32	28.0
Long Point PM_{10}	16	17.0

TABLE 6.10 2024 TSP ANNUAL AVERAGE RESULTS COMPARED AGAINST CUMULATIVE PREDICTIONS FOR YEAR 9 – WARKWORTH CONTINUATION EIS (2014).

Monitoring Location	Long Term (annual average) TSP criteria	
	Year 9 EIS Prediction (µg/m³)	2024 Annual Average (µg/m³)
MTO TSP	50	62.9
Loders Creek TSP	41	54.4
WML TSP	35	43.1
Warkworth TSP	68	128.6
Long Point TSP	38	46.7

6.4.2.8 Greenhouse Gas

Yancoal's operations report under the National Greenhouse and Energy Reporting (NGER) Scheme for the 2023-2024 financial year. Whilst Mount Thorley and Warkworth are separate facilities for the purpose of NGER reporting, the combined MTW Scope 1 and Scope 2 emissions calculated for the 2023-2024 financial year was 1,088,300t CO2-e. MTW Scope 1 and Scope 2 emissions calculated for the 2022-2023 financial year was 949,843t CO2-e. The approximate 14.6% increase in emissions can be largely attributable to an increase in total overburden removed and ROM coal mined between the reporting years. Scope 1 and Scope 2 emissions attributable to MTW are generally consistent with Environmental Assessment predictions * [See note in this Section].

MTW implemented the following in 2024 to improve fuel use efficiency and reduce emissions:

- Engines in 2 Excavators replaced with more fuel efficient engines.
- Lighting plants upgraded from light globes to LEDs
- Optimisation of prestrip travel routes and haulage routes to waste dumps to reduce haul cycle, idle, and queuing times.

- Strategic use of mobile crib huts and mobile fuel farms to reduce HME travel times for breaks and refuelling.
- Larger trucks used for more efficient topsoil haulage to dumps rather than smaller articulated trucks when available.
- New water fill point at the Flyover Road used to increase road watering efficiency by utilising water carts more efficiently.

Note: * - The most recent environmental impact statement (EIS) for the facility was prepared in 2014 to support the NSW development application for SSD-6464. This EIS included an assessment of greenhouse gas impacts in Appendix G – Air Quality and Greenhouse Gas Assessment, Warkworth Continuation 2014 which was prepared by Todoroski Air Sciences in June 2014. The greenhouse gas assessment included a relevant earlier estimate of scope 1 emissions. It estimated that based on producing a maximum of 18 Mt of ROM coal per calendar year, Warkworth would emit an average of 882,056 t CO2e scope 1 emissions.

Regarding the fugitive emissions estimates which form part of our total scope 1 emissions, these are not directly comparable due to a change in reporting methodology. The relevant earlier estimate used the default fugitive emissions factor of 0.045 t CO2e/t ROM coal for open cut mines in NSW as set out in the 2013 Australian National Greenhouse Gas Accounts – National Greenhouse Accounts Factors. Since this time under the Commonwealth NGER Act, the method 1 default factor for open cut coal mines in NSW has increased. Further, Warkworth has refined its gas understanding and changed to method 2 reporting under the NGER Act. As such, a direct comparison of current emissions reported under the NGER Act to those presented in the EIS is not considered practicable or informative. The NGER data is subject to the rigour required under the NGER Act which includes third party assurance.

6.5 Heritage Summary

6.5.1 Heritage Management

During the reporting period, Aboriginal Cultural Heritage and Historic Heritage was managed in accordance with the site's approved Aboriginal Heritage and Historic Heritage Management Plans. A summary of the performance in each of these areas is outlined below.

6.5.2 Heritage Performance

6.5.2.1 Aboriginal Heritage

6.5.2.1.1 Aboriginal Heritage Activities

Aboriginal cultural heritage was managed in accordance with the MTW Aboriginal Heritage Management Plan (AHMP) and the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (the Due Diligence Code).

The MTW Aboriginal Cultural Heritage Working Group (CHWG) is the primary forum for Aboriginal community consultation on matters pertaining to cultural heritage. The CHWG is comprised of

representatives from MTW and Registered Aboriginal Parties (RAPs) from Upper Hunter Valley Aboriginal community groups, corporations and individuals.

MTW was issued Care Agreement C0003708 on 26 April 2019 by the Office of Environment and Heritage (now Heritage NSW), which approved the transfer and safekeeping of Aboriginal objects and was a replacement of Care Agreement C0001841. On 19 October 2020, the Aboriginal objects specified in Care Agreement C003708 were transferred to the updated location for safekeeping. Heritage NSW was advised of the transfer on 29 October 2020.

On 27 November 2024 a sub-surface investigation was conducted at artefact scatter site MTW-50 (AHIMS ID 37-6-2349) in accordance with the provisions of the MTW Aboriginal Heritage Management Plan. The sub-surface investigation followed collection of surface artefacts during an earlier salvage program. Representatives of the CHWG participated in the salvage program which was undertaken in association with a consultant archaeologist. No artefacts were recovered during the sub-surface investigation and no stratified soil deposit worthy of further investigation was encountered. Inspection of the investigation area and surrounds prior to the commencement of excavation yielded 11 mudstone artefacts consisting of flakes, broken flakes, and debitage pieces. These artefacts were salvaged and catalogued, prior to storage at MTW's cultural heritage keeping place.

No new Aboriginal cultural heritage assessments were required during the reporting period. There were no "Chance Finds" of new Aboriginal cultural heritage sites identified by site personnel during the reporting period however two new artefact sites were identified by CHWG representatives during the Annual Compliance Audit Inspection. New site MTW-730 comprised a single mudstone flake and new site MTW-731 consisted of one mudstone flake and two silcrete flakes with existing sites situated in the wider vicinity of both new locations. AHIMS and MTW databases were updated with the new sites details and extents.

Conservation Agreements for the Wollombi Brook Aboriginal Cultural Heritage Conservation Area (WBACHCA) and Loders Creek Aboriginal Cultural Heritage Conservation Area (LCACHCA) were signed on 3 November 2022 under delegation of the Minister administering the *National Parks and Wildlife Act 1974*. During the reporting period work continued to register the Agreements on title for the lands of the Conservation Areas - the NPWS Deputy Secretary signed the registration documents, and progressed to NPWS legal team ahead of lodgement with Land Registry Service. Work to finalise the registrations is ongoing at the end of the reporting period.

A previously reported project to reconcile the MTW Cultural Heritage Management Database with the NSW Heritage AHIMS database was completed during the period. The key outcomes of the reconciliation process included: inclusion of 308 AHIMS sites to the MTW database following completion of land transfers from HVO and inclusion of sites salvaged prior to 2005; the addition of 23 MTW sites to AHIMS; and update of AHIMS site details for 102 sites (recognise as salvaged, and update of site type and location details).

Consultation with the CHWG and formation of the Plan of Management Implementation Group (PMIG) for the Wollombi Brook Aboriginal Cultural Heritage Conservation Area (WBACHCA) and Loders Creek Aboriginal Cultural Heritage Conservation Area (LCACHCA) did not occur during the reporting period. Formation of the PMIG and review and progression of the implementation plans for the Conservation Areas is planned to occur during the next reporting period. Planned works to prepare for relocation of the Site M grinding grooves from the storage area remain to be considered and guided by the PMIG.

6.5.2.1.2 Audits and Incidents

During the reporting period there were 39 Ground Disturbance Permits (GDPs) assessed for cultural heritage management considerations at MTW. Ground disturbance works were conducted based on an Aboriginal cultural heritage sites avoidance policy so that no un-salvaged sites were impacted by these activities. There were no known incidents, nor any unauthorised disturbance caused to Aboriginal cultural heritage sites at MTW during 2024.

An AHMP compliance inspection covering the 2024 reporting period was undertaken across 25-26 November 2024. This inspection was conducted by representatives of the Aboriginal community, internal MTW personnel, and a consultant archaeologist with 57 Aboriginal cultural heritage sites reviewed during this program. No unauthorised site disturbances or AHMP non-compliances were identified during the inspection and no issues were raised by the CHWG representatives present. The Aboriginal Heritage Management Plan Inspection report is provided in **Appendix 3**.

6.5.2.2 Historic Heritage

6.5.2.2.1 Historic Heritage Activities

Historic heritage was managed in accordance with the MTW Historic Heritage Management Plan (HHMP). In 2012 the MTW Cultural Heritage Advisory Group (CHAG) was established as a community consultation forum for matters pertaining to management of historic (non-Indigenous) heritage located on MTW lands. The CHAG is comprised of community representatives with knowledge and interests in the historic heritage of the region such as historical groups, individuals and local government.

The MTW Historic Heritage Conservation Fund (HHCF) was launched by Singleton Council in December 2018, in accordance with Schedule 17 of the HHMP. MTW has made all of the agreed contributions to the fund with the final contribution made in the 2022 reporting period. The availability of the fund is advertised on the Singleton Council and MTW websites, and directly to landowners with registered heritage items, and continued to be available during the 2024 reporting period. Applications for funding under the HHCF are considered by Singleton Council's Singleton Heritage Advisory Committee (SHAC) and recommendations made to Council. There were two successful applications to the HHCF in the 2024 reporting period. The balance of the HHCF at end of 2024 is $406,716.50.

The MTW Great North Road Conservation Fund (GNRCF) was established by MTW in May 2017, in compliance with Condition 45 of the Warkworth development consent SSD-6464. MTW has made all

of the agreed contributions to the fund with the final contribution made in the 2019 reporting period. The purpose of the fund is to provide resources to promote positive heritage outcomes for the convict built Great North Road. At commencement of the partnership with the Convict Trail Project (CTP) in relation to the GNRCF, a list of seven projects to be funded was developed. In 2022, CTP provided an updated projects listing including one additional project. A status update report from CTP was received November 2024, identified a new part-time project manager with qualifications in archaeology and geology is assisting review and progress with approved projects. Funds expended to date on GNRCF projects to end November 2024 is $21,360.95.

During the reporting period routine area maintenance works were undertaken at Springwood Homestead, the Red Brick House, and the RAAF Cook House. A structural engineering inspection was undertaken at each of the three buildings and initial structural stabilisation works were completed at Springwood Homestead (**Figure 23, Figure 24** and **Figure 25**). Minor repairs were undertaken on several occasions at the Red Brick House to re-attach weather hoarding boards following removal by unknown persons. Works planned for the period at the heritage buildings were disrupted by access constraints due to periods of wet weather with monthly rainfall volumes consistently exceeding long term averages for much of the reporting period. Work to re-establish reliable access to the RAAF Cook House and Springwood Homestead remain key projects for the upcoming period to enable follow-on works to remove asbestos and suspended tree fall prior to structural stabilisation at the RAAF Cook House, and to remove adjacent trees and further stabilise Springwood Homestead.

An Historic Heritage Management Plan (HHMP) compliance inspection covering the 2024 reporting period was conducted between 22-27 November 2024. This inspection was conducted by a consultant archaeologist escorted by MTW personnel. Three historic heritage sites were inspected during this program. No incidents or any unauthorised disturbance was identified at historic heritage sites at MTW during 2024. The Historic Heritage Management Plan Inspection Report is shown in **Appendix 4**. Actions arising from the audit will inform works to be undertaken during the upcoming reporting period.



FIGURE 23: INITIAL STRUCTURAL STABILISATION WORKS AT SPRINGWOOD HOMESTEAD VIEWED FROM THE NORTHERN ASPECT



FIGURE 24: INITIAL STRUCTURAL STABILISATION WORKS AT SPRINGWOOD HOMESTEAD VIEWED FROM THE EASTERN ASPECT



FIGURE 25: INITIAL STRUCTURAL STABILISATION WORKS AT SPRINGWOOD HOMESTEAD VIEWED FROM THE SOUTHERN ASPECT

6.6 Visual Amenity and Lighting

6.6.1 Visual Amenity and Lighting Management

MTW aims to minimise visual amenity impacts from its operations. Two of the main controls used are lighting management and visual screening.

6.6.2 Visual Amenity and Lighting Performance

6.6.2.1 Lighting

MTW aims to provide sufficient lighting for work to be undertaken safely, whilst minimising disturbance to neighbouring residents and public road users, particularly nearby residents in Bulga Village, Mount Thorley, Warkworth Village, Long Point, Milbrodale and motorists on the Putty Road and Golden Highway.

Actions undertaken in 2024 to manage lighting impacts at MTW included:

- Routine night shift inspections conducted by Community Response Officers to observe operating practices and to ensure lights are not shining towards nearby residential areas or affecting public roads;
- Yellow lights are used in preference to white lights in areas based on risk and external exposure;

- Alternate sheltered dumps are operated, or work areas are shut down if lighting or visual amenity issues arise and cannot be sufficiently managed.

6.6.2.2 Visual Screening

Visual screening of MTW's operations incorporates various methods to best suit the terrain and infrastructure constraints around the boundary of the mine.

Visual bunding has an immediate screening effect, providing complete screening in areas where vegetation would be inadequate to filter views or where additional height is required. Bunds may be vegetated where practicable and feasible for visual amenity and to mitigate erosion. During the 2024 reporting period MTW extended a visual bund between Putty Road and WML's West Pit, treating the completed bund with hydromulch to promote vegetative growth on the new bund.

Built screens (i.e. solid fences or walls), may be used as an alternative when bunds and tree screens are not practicable. Temporary screens (i.e. fencing and shade mesh) may also be used as required for interim screening.

Shade cloth was attached to the existing fence along Putty Road in July 2024 and remains in place. This visual screen fencing is an interim measure prior to the establishment of vegetation. Vegetation plantings were undertaken in 2020 to infill between existing trees/shrubs. Slashing works were also undertaken in 2024 along Putty Road, improving visual amenity.

6.7 Water

6.7.1 Water Management

An adaptive management approach is implemented at MTW to achieve the following objectives for water management:

- Fresh water usage is minimised;
- Impacts on the environment and MTW neighbours are minimised; and
- Interference to mining production is minimal.

This is achieved by:

- Preferentially using mine water for coal preparation and dust suppression where feasible;
- An emphasis on control of water quality and quantity at the source;
- Segregating waters of different quality where practical;
- Recycling on-site water;
- Ongoing maintenance and review of the water management system; and
- Releasing water to the environment in accordance with statutory requirements.

Plans showing the layout of key water management structures and key pipelines are shown in **Figure 26**. The MTW Water Management Plan contains further detail on management practices and is available on the MTW website https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mgt-docs.

Improvements to water management in 2024 included:

- Construction complete of North Out of Pit (NOOP) water management structure that will provide improved water security and balance position at MTW. Dewatering infrastructure installation commenced. The NOOP dam is approved by the Warkworth Continuation Project development consent SSD-6464.
- Construction commenced of the final sediment water management structures including dams for the western advancing pre-strip at WML. These structures were designed in accordance with the NSW Blue Book, Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries.
- Operation of the Bulga Coal water share project which transfers mine water for use in Bulga Coal operations.
- Desilting of Dams 2N, 21N, 22N, 24N, 31N, 42N, 5S and 9aS. 3S commenced.
- Installation of additional internal water transfer pipeline.
- Construction commenced for the designed increased discharge rate infrastructure for the MTO discharge point under the Hunter River Salinity Trade Scheme.
- Electrification of the pump on Loder Pit Tailings Storage Facility to increase water transfer capacity.
- Remote boundary monitoring system installed on Dam 20S.
- Maintenance completed to the headwall of Doctors Creek.

There were no water related incidents during the reporting period.

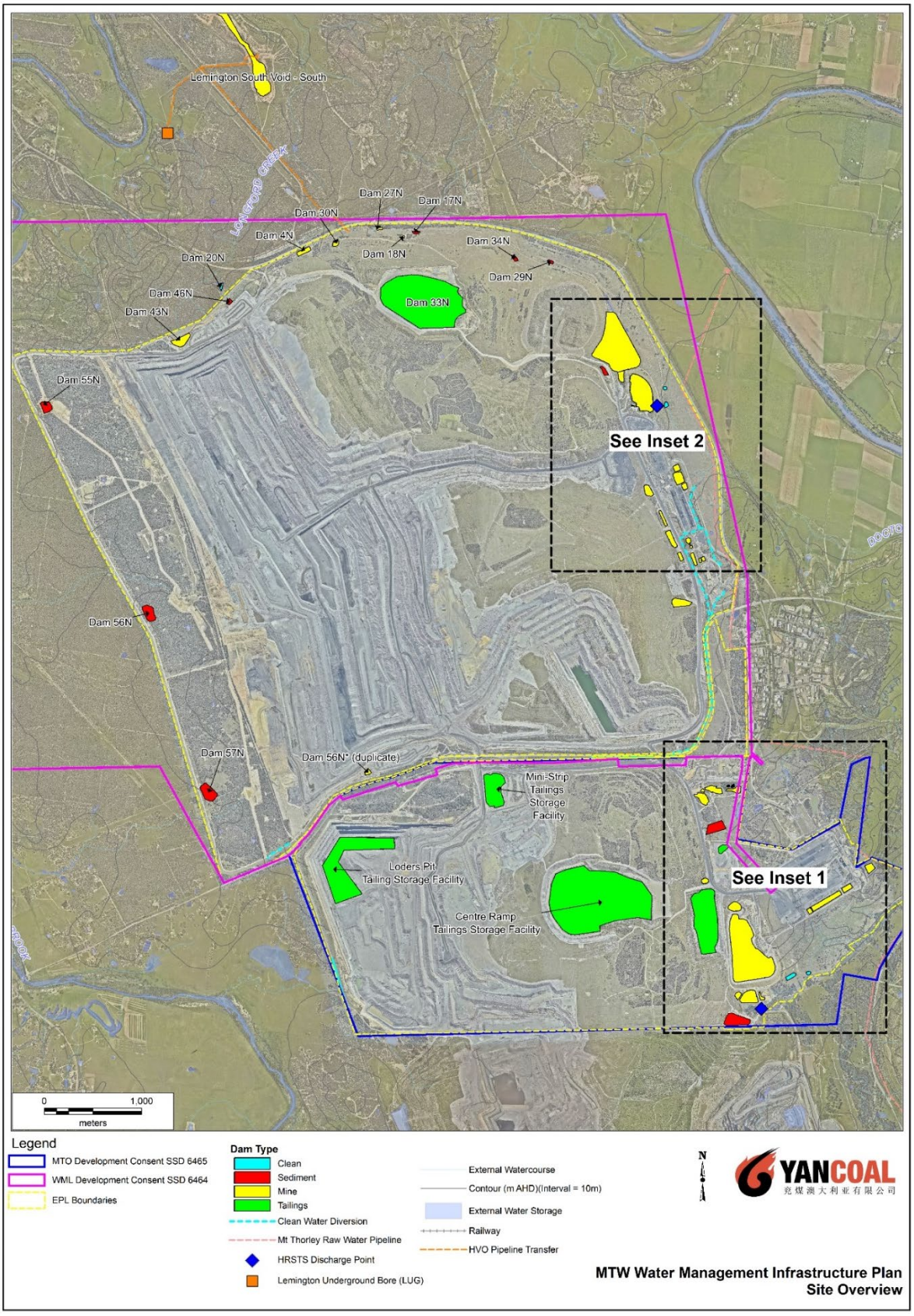


FIGURE 26: WATER MANAGEMENT INFRASTRUCTURE PLAN – SITE OVERVIEW

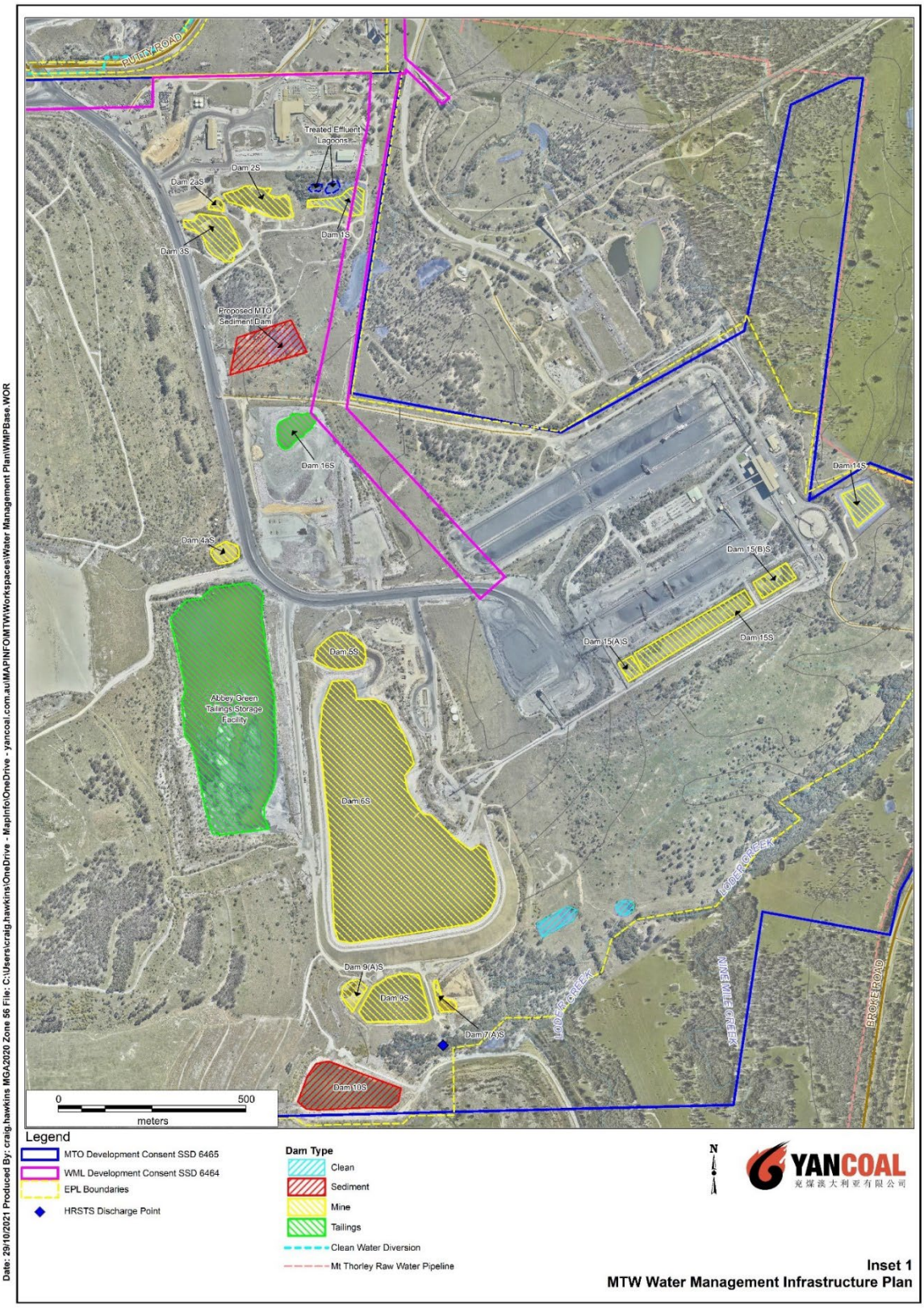


FIGURE 26A – MTW WATER MANAGEMENT INFRASTRUCTURE PLAN – INSET 1 (MTO DETAIL)



FIGURE 26B – MTW WATER MANAGEMENT INFRASTRUCTURE PLAN - INSET 2 (WML DETAIL)

6.7.2 Water Balance Performance

MTW uses a water balance to record and assess water flux, but also to forecast and plan water management needs. These annual site water balances are then compared to previous results. A 2024 static water balance for MTW is presented in **Table 6.11** and a simplified schematic of this balance is included in **Figure 27**. A salt flux schematic is shown in **Figure 28**.

TABLE 6.11 STATIC MODEL RESULTS, ANNUAL WATER BALANCE

Water Stream	Volume (ML) (% Total)
Inputs	
Rainfall Runoff	7,345 (73%)
Hunter River (MTJV supply scheme)	692 (7%)
Potable (Singleton Shire Council / trucked)	66 (<1%)
Groundwater	428 (4%)
Recycled to CHPP from tailings (not included in total)	4,573
Imported (LUG bore)	305 (3%)
Imported (Hunter Valley Operations)	0 (0%)
Water from ROM Coal	1,185 (12%)
Total Inputs	**7,246**
Outputs	
Dust Suppression	970 (12%)
Evaporation – mine water dams	1,777 (22%)
Entrained in process waste	2,777 (35%)
Sharing with other mines	201 (3%)
Discharged (HRSTS)	135 (2%)
Water in coarse reject	712 (9%)
Water in product coal	1,084 (13%)
Miscellaneous use (wash-down etc.)	355 (4%)
Total Outputs	**8,012**
Change in storage	**-766**

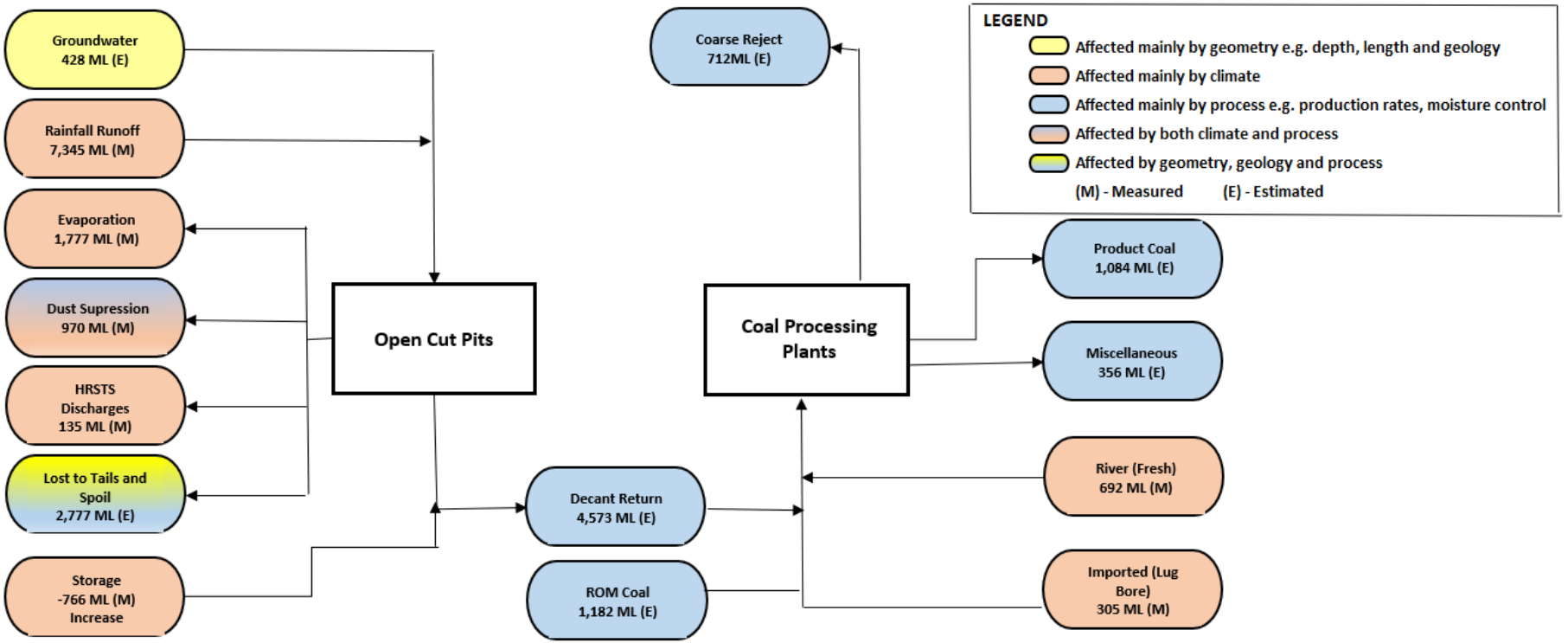


FIGURE 27: SCHEMATIC DIAGRAM MTW WATER FLUX

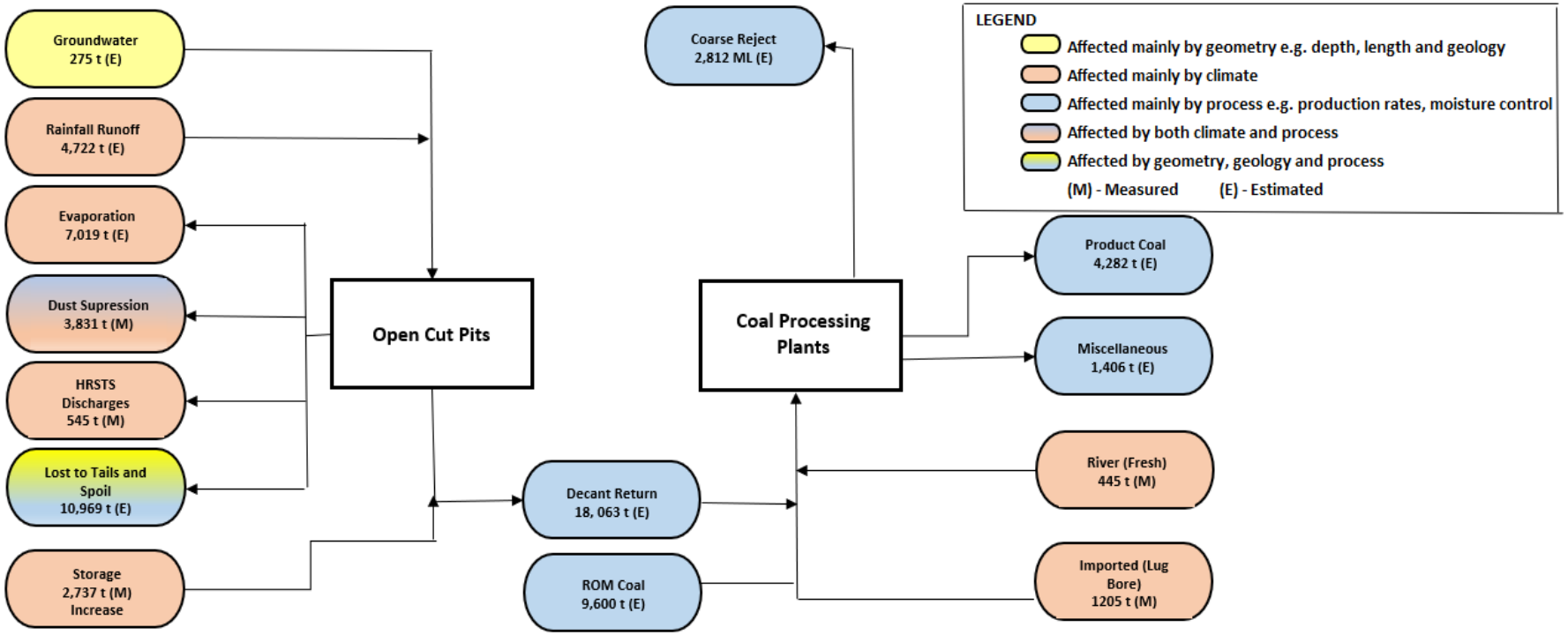


FIGURE 28: SCHEMATIC DIAGRAM MTW SALT FLUX

6.7.2.1 Water Inputs

A total of 590mm of rainfall was recorded at MTW in 2024 producing a calculated 7,345ML of runoff from developed, disturbed and mining catchments. Water falling on clean water catchments is diverted off site into natural systems where possible. Rainfall runoff was the largest input to the site mine water balance in 2024.

Water was required to be imported to meet site demand during 2024. During the reporting period 305 ML was imported from the LUG bore by MTW, compared to the previous reporting period (545ML extracted in 2023).

MTW also sources water from the Hunter River via the Mount Thorley Joint Venture (MTJV) water supply scheme. Singleton Shire Council holds the high security water licence on behalf of the scheme members. Singleton Shire Council maintains and operates the scheme to supply raw water to MTW, Glencore's Bulga Coal complex, and to meet Council's own needs. MTW's share of the MTJV allocation is 1,009 ML per water reporting year.

A total of 692 ML of water was abstracted from the Hunter River during the reporting period for MTW operations which was slightly more than the volume of water extracted in the previous reporting period. (195 ML extracted in 2023).

Groundwater Licences are held for each mining excavation area. Passive take via seepage inflows into the mining excavations is accounted for against relevant water source Water Access licences. Water Licences and access entitlements held by MTW are detailed in **Table 3.5** and **Table 3.6.**

Licence conditions require the volume and quality of water taken by the works to be measured and reported on an annual water calendar year basis (i.e. financial year). Groundwater inflows via pit wall seepage are at low rates, with a significant proportion evaporating at the coal face. The remainder reports to the pit floor, where it may accumulate along with direct rainfall, rainfall runoff and leakage from spoils. As a result, it is not possible to physically measure the volume of water taken by these groundwater licences, nor the quality of waters extracted via seepage to the pits. Ground water inflows volumes are estimated based on modelling from Australasian Groundwater and Environmental Consultants Pty Ltd (2015), *Mount Thorley and Warkworth Mines Long Term Approvals Model Update* (Project No G1468G, February 2015).

6.7.2.1 Water Outputs

Significant water uses at MTW in 2024 were for evaporation from Dams (1,777 ML), water entrained in process waste (2,777 ML) and dust suppression on haul roads, mining areas and coal stockpiles (970 ML). Water sharing to Bulga Coal from MTO was utilised in 2024 (201 ML).

MTW participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points during declared discharge events associated with increased flow in the Hunter River. During high flows, each HRSTS participant is entitled to discharge a share of the total

allowable discharge into a block of water passing down the Hunter River according to the number of HRSTS salt credits that they hold. Credits may be traded between participants to ensure that saline water is being managed in the most cost-effective way.

There are 1000 credits, each entitling the holder to discharge 1/1000 of each high flow day's total allowable discharge. The credits may be traded between participants so that those holders who do not need to discharge can trade their entitlement to others with the greatest need HRSTS discharge opportunity. HRSTS discharges are undertaken in accordance with HRSTS regulations (including the need to hold HRSTS credits for the discharges undertaken), and the licence conditions of EPL 1376 and EPL 1976.

MTW maintains two licensed HRSTS discharge monitoring locations:

- Dam 1N, located at WML North, which discharges to Doctor's Creek; and
- Dam 9S, located at MTO South, which discharges to Loders Creek.

During the reporting period, no discharge occurred from Dam 1N (WML) under the HRSTS. A total of 1345 ML was discharged from Dam 9S (MTO) during the reporting period.

6.8 Surface Water Management

Surface water monitoring activities continued in 2024 in accordance with the MTW Water Management Plan and MTW Surface Water Monitoring Programme. MTW maintains a network of surface water monitoring sites located at selected site dams and surrounding natural watercourses as shown in **Figure 29**. Water quality monitoring is undertaken to verify the effectiveness of the water management system onsite, and to identify the emergence of potentially adverse effects on surrounding watercourses. Primary water storage dams are monitored routinely to verify the quality of mine water, used in coal processing, dust suppression, and other day to day activities around the mine.

Surface water monitoring data review involves a comparison of measured pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS) results against internal trigger values which have been derived from the historical data set. The response to measured samples outside the trigger limits is detailed in the MTW Water Management Plan.

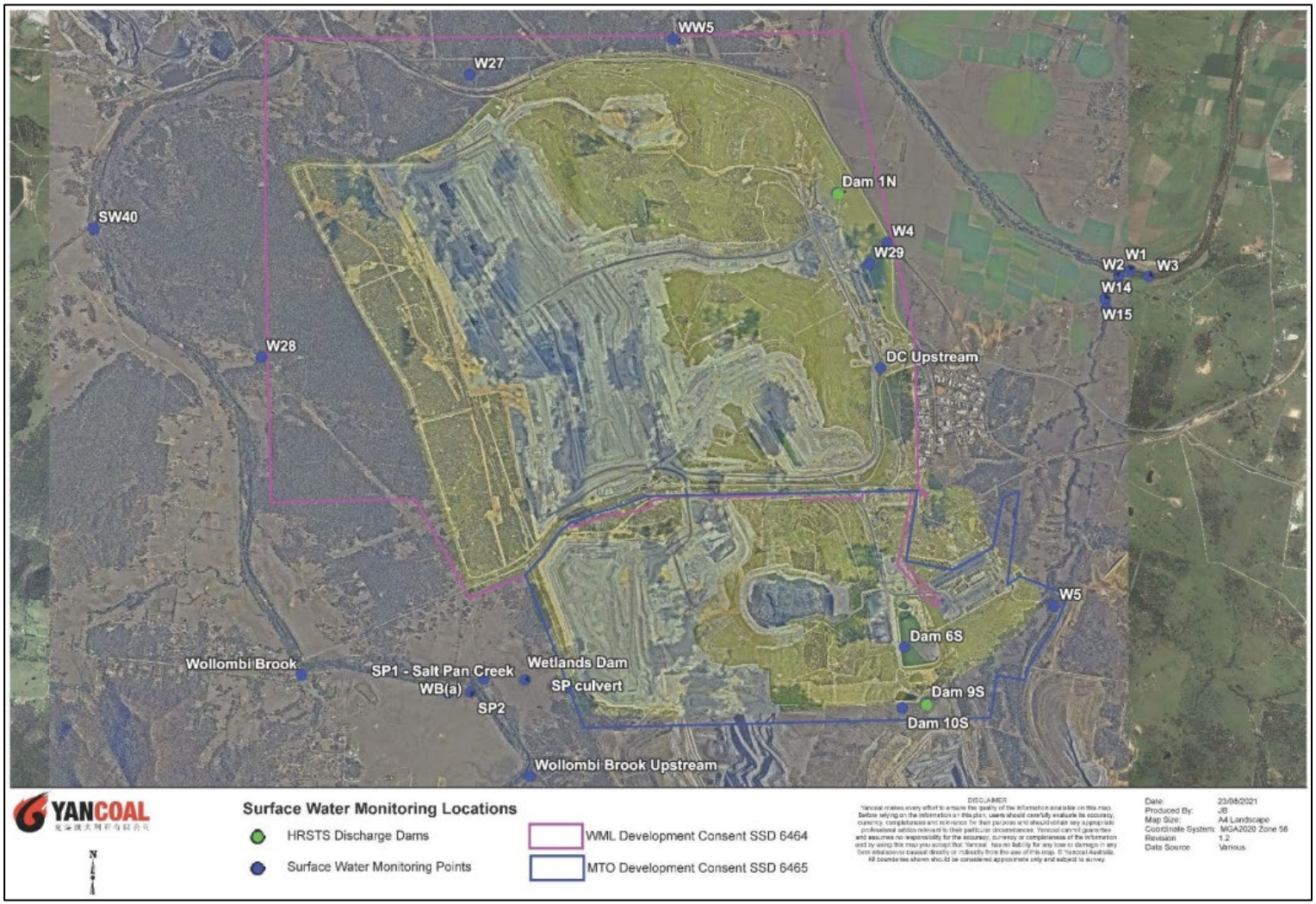


FIGURE 29: SURFACE WATER MONITORING POINTS

6.8.1 Surface Water Performance

Routine surface water monitoring was undertaken from twelve (12) sites and rain event sampling was undertaken from thirteen (13) sites. Sampling of surface waters was carried out in accordance with AS/NZS 5667.6 (1998). Analysis of surface water was carried out in accordance with approved methods by a NATA accredited laboratory.

Water quality is evaluated through the assessment of pH, EC and TSS. All surface water sites were also sampled for comprehensive analysis annually. The sampling frequency for ephemeral water sites was modified in 2016, from quarterly to a rain-event trigger system in an effort to ensure samples taken were more representative of typical water quality for those streams (up to eight sampling events per annum can now be taken under the revised sampling protocol). During the reporting period, there were two rain event sampling runs completed. All required sampling and analysis was undertaken, except as detailed in **Table 6.12**. Trigger tracking results are described in **Table 6.13**.

TABLE 6.12 MTW WATER MONITORING DATA RECOVERY FOR 2024 (BY EXCEPTION)

Location	Data Recovery (%)	Comment
W1	75%	No safe access to site in January.
W2	75%	No safe access to site in January.
W3	75%	No safe access to site in January.
W27	50%	Insufficient water to take a sample in April.
W28	0%	No safe access to site in April and May.
WW5	50%	Insufficient water to take a sample in September and December.
SW40	75%	No safe access to site in December.
SP Culvert	0%	Insufficient water to take a sample in April and May.
SP2	50%	Insufficient water to take a sample in April.
Wetlands Dam	50%	No safe access to site in April.

Note: Missing data indicates that there was insufficient water to take a sample, or that there was no safe access.

A summary of all surface water monitoring results is provided in the MTW Monthly Environmental Monitoring Reports and can be viewed via MTW's website (https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mgt-docs).

Figure 30 to **Figure 35** show long term water quality trends for the Hunter River, Wollombi Brook, other surrounding tributaries and site dams.

Measurements of EC were generally stable during the reporting period across the majority of sites and consistent with historical seasonal trends. Elevated EC level was recorded during the reporting period at the W1, W2 and W3 monitoring site located on the Hunter River, and W27 (Longford Creek) monitoring sites. The sites with elevated levels will continue to be monitored for future elevated levels and investigated as required.

Measurements of pH were generally stable during the reporting period across the majority of sites and consistent with historical seasonal trends. No sites triggered the 95th percentile/upper limit during the reporting period and will continue to be monitored for future elevated levels and investigated as required.

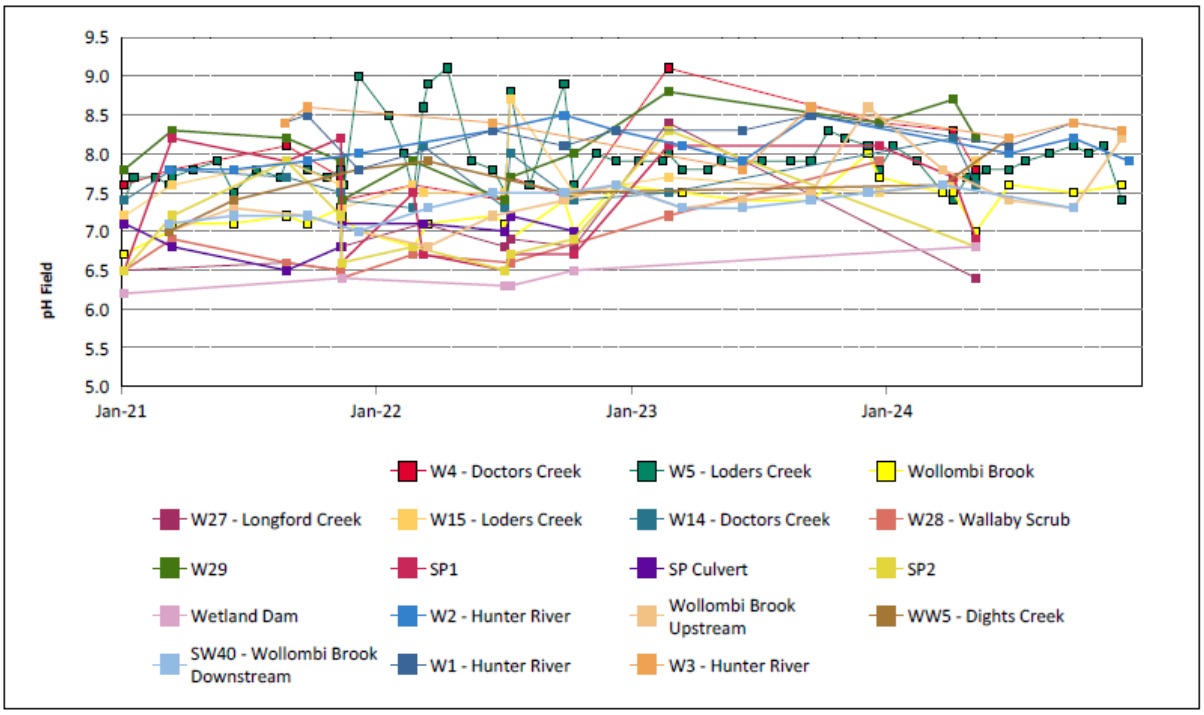
A number of TSS limits were triggered in the reporting period, which were generally associated with rainfall events or sampling from pooled section of watercourses; these are outlined below in **Table 6.13**. Monitoring results will continue to be monitored for future elevated levels and investigated as required. These results are also provided in the Monthly reports provided on the MTW Insite website (https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mgt-docs).

TABLE 6.13 SURFACE WATER MONITORING - TRIGGER TRACKING RESULTS

Site	Date	Trigger Limit Breached	Action Taken in Response
W2	12/12/2024	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Unlikely to be associated with MTW mining related impacts. Elevated TSS on 12/12/2024 associated with runoff due to rain event (15.4mm between 27/11/2024 – 01/12/2024), resulting in mobilisation of sediment.
W5	13/02/2024 21/03/2024 2/12/2024	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to sampling from water with no flow (pool of water). Note: Result is not considered to be a valid representation given that there was no flow at the time of sampling. Additionally, TSS returned to within trigger level for subsequent sampling on 24/04/2024, 7/05/2024, 24/06/2024, 17/07/2024, 21/08/2024, and 23/09/2024. No follow up required. Unlikely to be associated with MTW mining related impacts. Elevated TSS on 2/12/2024 associated with runoff due to rain event (15.4mm between 27/11/2024 – 01/12/2024), resulting in mobilisation of sediment.
WW5	21/03/2024	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Elevated TSS associated with high runoff due to rain event (24.4mm between 17/03/2024 – 20/03/2024), resulting in mobilisation of sediment. TSS returned to within trigger level for subsequent sampling round on 24/06/2024. No follow up required.
W4	05/04/2024	TSS – 50mg/L (ANZECC Criteria)	Elevated TSS considered associated with runoff due to rainfall event, resulting in mobilisation of sediment. No MTW site sources of sediment identified. TSS returned to within trigger level for subsequent sampling round on 7/05/2024. No follow up required.
W14	07/05/2024	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Elevated TSS considered associated with runoff due to rainfall event, resulting in mobilisation of sediment. No MTW site sources of sediment identified. No follow up required.
W15	07/05/2024	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Elevated TSS considered associated with runoff due to rainfall event, resulting in mobilisation of sediment. No MTW site sources of sediment identified. No follow up required.
W27	07/05/2024	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to sampling from water with no flow (pool of water).
WW5	24/06/2024	EC – 95th Percentile	Watching Brief*

Site	Date	Trigger Limit Breached	Action Taken in Response
			Subsequent monitoring on 23/09/2024 and 2/12/2024 unable to be completed due to the sample location having insufficient water to complete sampling.
W1	23/09/2024 02/12/2024	EC – 95th Percentile	Watching Brief*
W2	23/09/2024	EC – 95th Percentile	Watching Brief*
W3	23/09/2024 02/12/2024	EC – 95th Percentile	Watching Brief*

* = Watching brief established pending outcomes of subsequent monitoring events.



Note: Missing data indicates that there was insufficient water to take a sample, or that there was no safe access.

FIGURE 30: WATERCOURSE PH TRENDS 2021 TO 2024

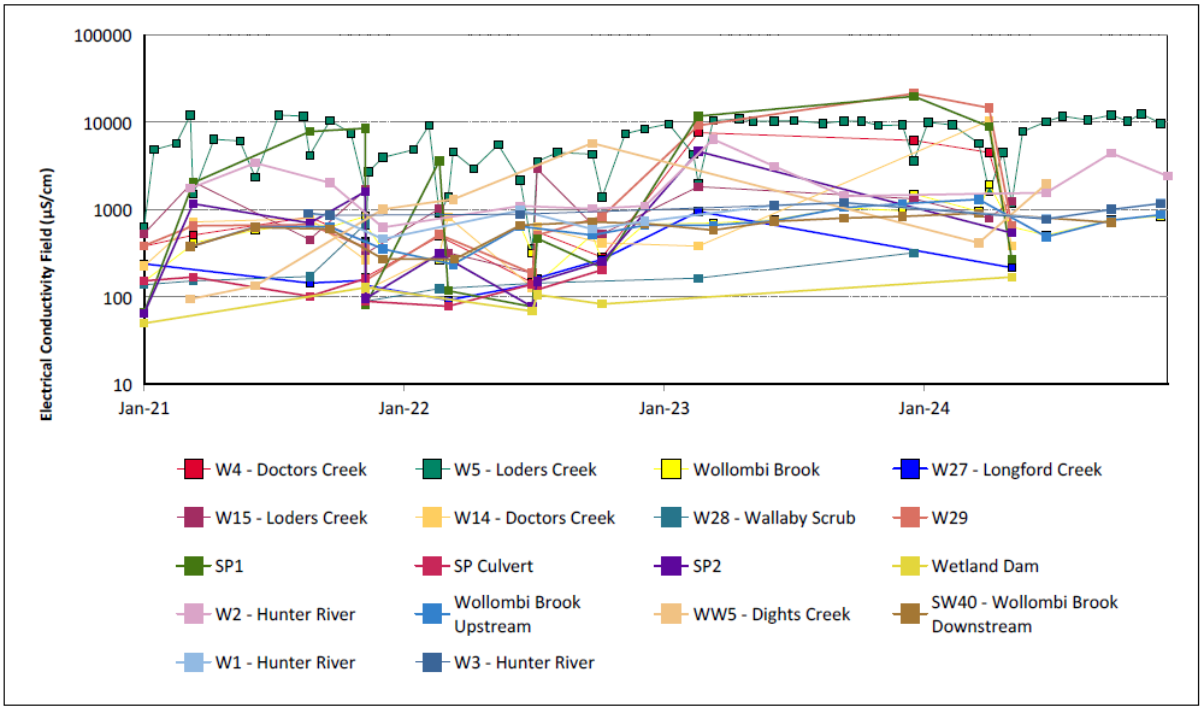


FIGURE 31: WATERCOURSE EC TRENDS 2021 TO 2024

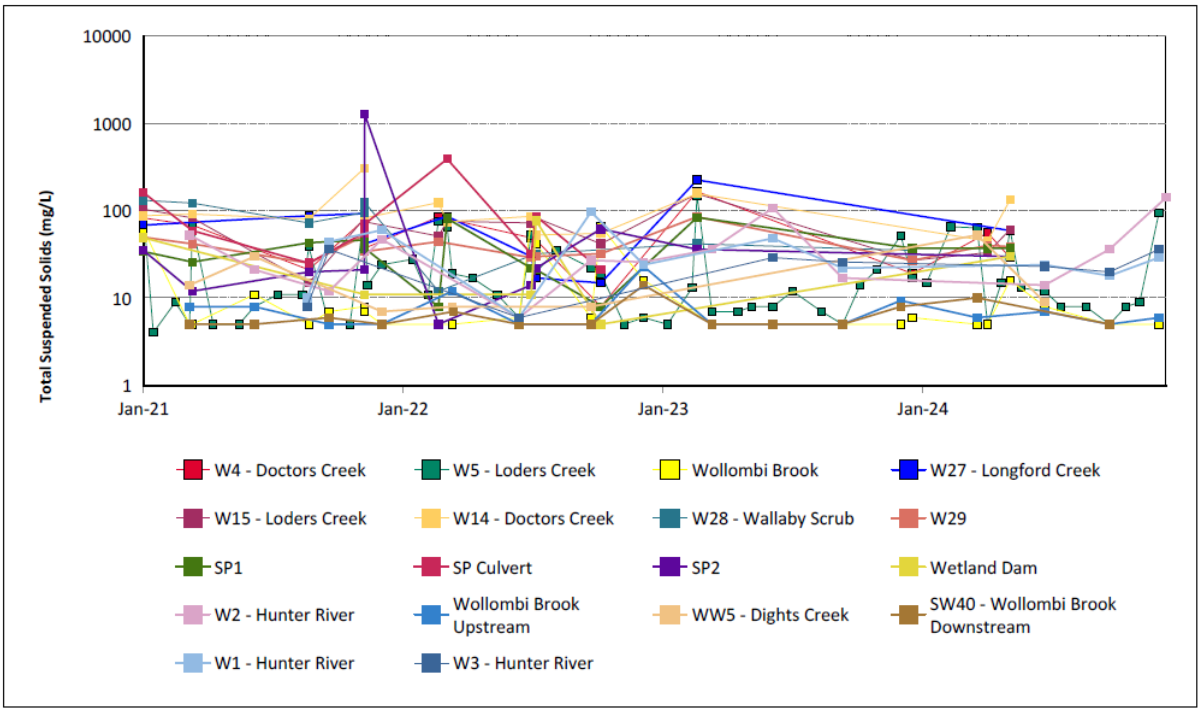


FIGURE 32: WATERCOURSE TSS TRENDS 2021 TO 2024

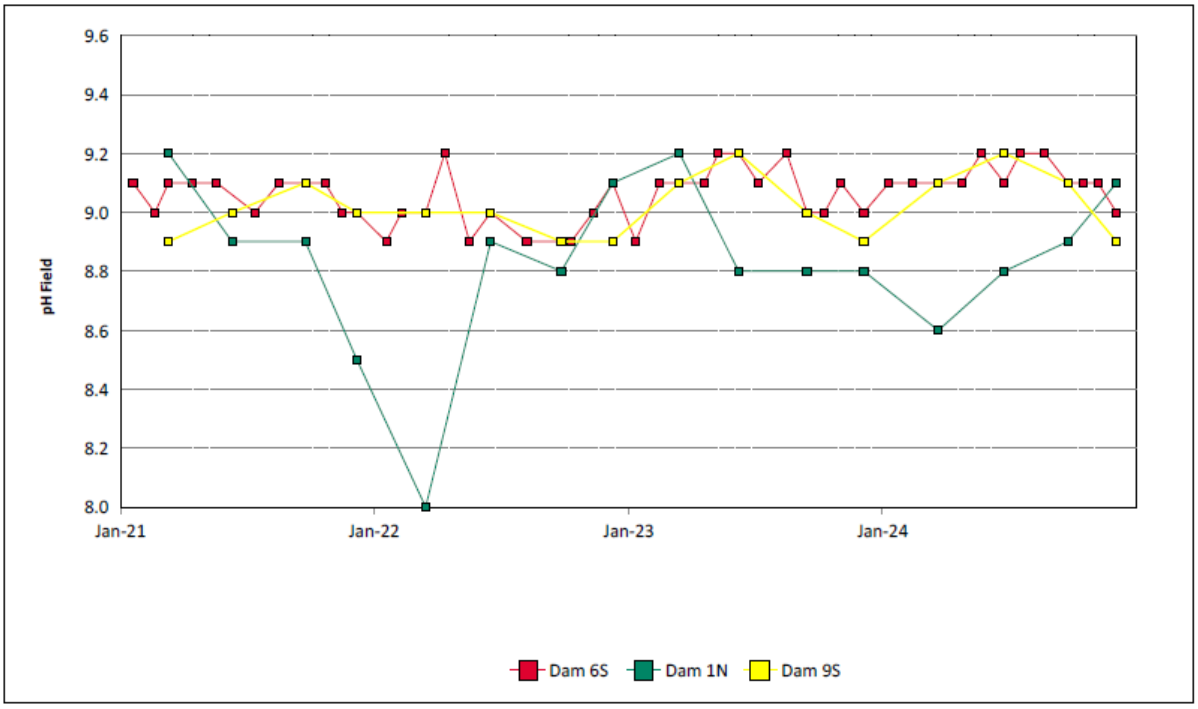


FIGURE 33: SITE DAMS PH TRENDS 2021 TO 2024

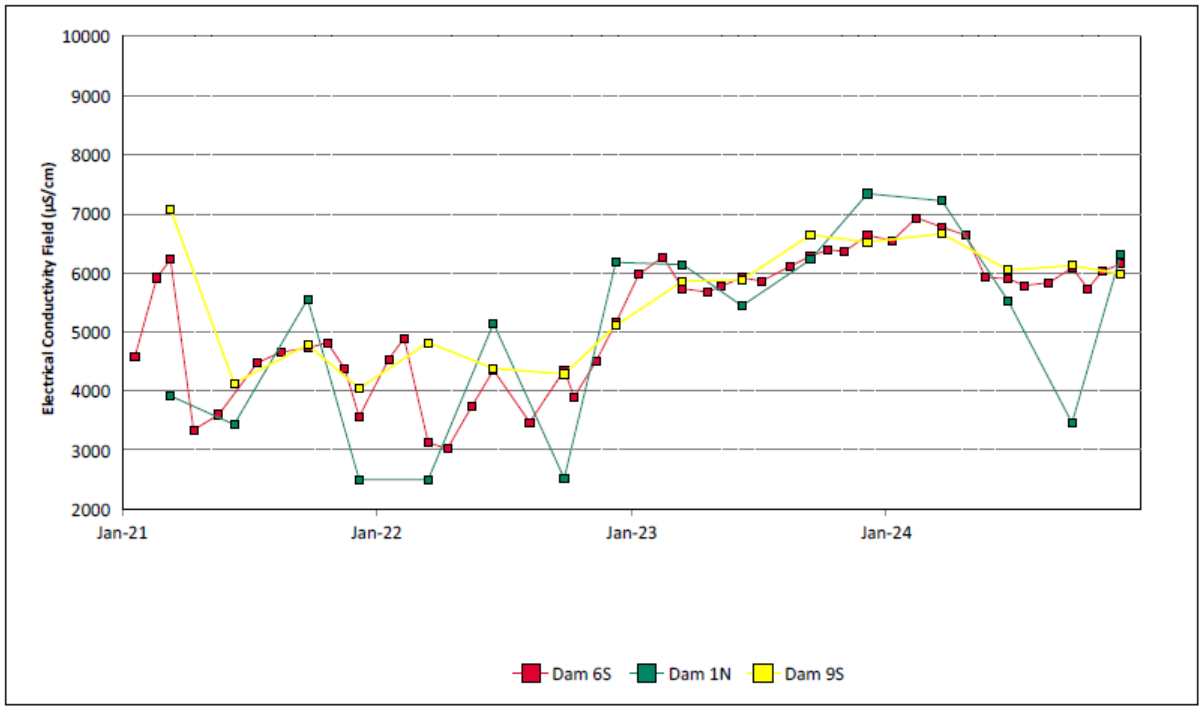


FIGURE 34: SITE DAMS EC TRENDS 2021 TO 2024

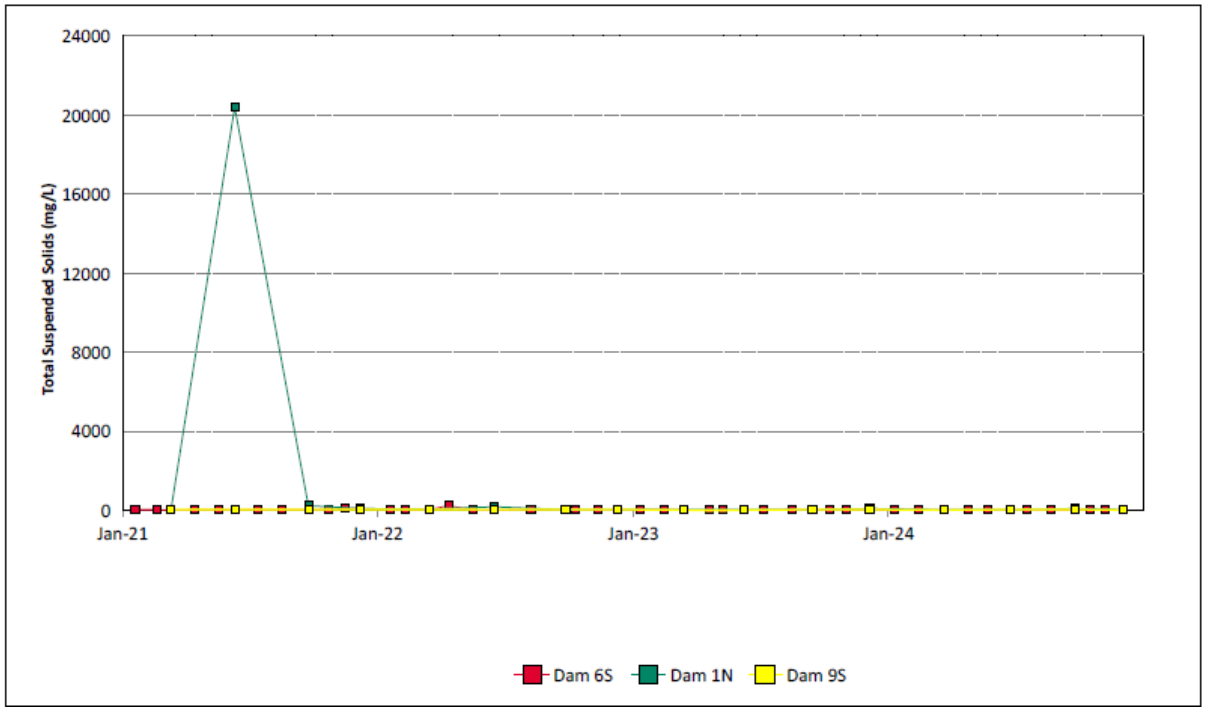


FIGURE 35: SITE DAMS TSS TRENDS 2021 TO 2024

6.8.1.1 Stream Health and Channel Stability

A programme to monitor and report on the stream and riparian vegetation health in Loders Creek and Wollombi Brook which may be potentially affected by the development commenced in 2016. The monitoring programme at times been conducted in conjunction with a similar programme managed by Bulga Surface Operations.

The annual monitoring program includes the following:

- Documenting locations and dimensions of significant erosive or depositional features;
- Photographs upstream, downstream, at both the left and right banks;
- Rating the site with the Ephemeral Stream Assessment protocol developed by the CSIRO to assess the erosional state of the creek at the monitoring location (a measure of channel stability);
- Rating the site with the Rapid Appraisal of Riparian Condition (RARC) protocol developed by Land & Water Australia. This assesses the ecological condition of riparian habitats using indicators that reflect functional aspects of the physical, community and landscape features of the riparian zone (a measure of stream health); and
- Taking measurements of the channel cross-sections (transects) for comparison purposes for any future monitoring.

A copy of the annual stream health and channel stability monitoring report (Annual SHCS report) is provided as **Appendix 5**. The annual MTW stream health and channel stability monitoring survey was undertaken following a year of close to average rainfall patterns, characterised by variable and occasionally intense rainfall early in the year with increasing frequency and duration of dry spells during winter and over the months leading into the 2024 survey period. Despite some low to moderate flood activity between April and June, stream flows and water levels in Wollombi Brook were generally stable and gradually receding over the latter half of the year. Mount Thorley Warkworth Mine participates in the Hunter River Salinity Trading Scheme (HRSTS) and discharged a total of 135 ML from the MTW LDP over seven discharge days in April and June 2024.

The Annual SHCS report (Table 4) provides a summary of results for RARC and CSIRO over the past three years. Most of the CSIRO category scores remained unchanged and reflected the consistency in condition of site streambed and channel banks among study area drainages in 2024, which were attributed to the lack of intense rainfall and flash flow events. While subtle differences were detected for some of the CSIRO category features (e.g., changes in the distribution of vegetation on the drainage line floor or walls), most of the observations were insignificant enough to warrant changes in category scores, or existing scores were already at the maximum.

There were only four changes recorded for individual CSIRO category scores in 2024, owing to increases in vegetation occurring along the drainage line floor (LC12 and LC14), decreases in the degree of exposure along channel walls (LC16) or increases in the presence of fine sediments within the channel floor (LC3). While the change in score was not sufficient to change the overall CSIRO rating at LC16, Loder Creek site LC3 experienced a reduction in rating from *Active* to *Very Active,* with LC12

and LC14 both increasing ratings from *Active* to *Potentially Stabilising*. Note that site LC3 and LC12 have recorded fluctuations for these respective categories over the past two to four years.

The changes in scores at LC12, LC14 and (in part) LC16 are attributable to vegetation community responses to climatic conditions, whereas the changes at LC3 are attributable to natural fluvial processes (i.e., the downstream transport of catchment sourced sediments). Although some of the existing erosion scars, rills and gullies are considered active (unconsolidated in parts, and contributing sediments during wet weather events), there were no significant changes to the extent or prevalence of new erosion features at any of the sites, and where losses of fine sediments have been observed, there has usually been an associated response by vegetation (e.g. colonisation of settled colluvial sediments before entering the drainage channel at LC5 and LC6).

The Stream Health Monitoring RARC results in 2024 have showed consistency over the previous three surveys (Table 4 of the Annual SHCS report), enduring shifting environmental conditions. There were no changes to the RARC classification ratings in 2024, which included *Average* (Loder Creek site BM35, new site MTW LDP2 and Wollombi Brook site BM37) and *Good* (Loder Creek site BM34). These results can be attributed to the stability of riparian corridors primarily supported by the presence of mature canopy species, such as river-oak and swamp-oak, which contribute to detritus and structural debris, albeit with limited understory complexity.

Whilst each of the Stream Health Monitoring sites contain generally continuous riparian corridors dominated by swamp-oak (BM22, BM34 and BM35) or river-oak (BM37) canopy forming species, associated site-specific riparian and habitat features contribute to the observed variation in category scores and overall ratings. Localised erosion features are for the most part, restricted to the upper margins of the drainage channel in Loder Creek, where active bank erosion, slumped trees, and animal tracks (from livestock and wild pigs) contribute fine sediment to the creek line. Colonisation of the deposited fine sediments by vegetation (mostly grasses, swamp-oak saplings and weeds) has been observed in some areas, and although there has been some sparse colonisation of the erosion scars at the source (by swamp-oak saplings and weeds), the soil properties appear to be generally inhibitive to seed propagation, comprising a firm crust of clayey sand.

Recent exclusion of livestock from pasturelands adjacent to sites BM34 and BM37 has supported gradual riparian recovery, and although site conditions remain influenced by competition from invasive species and animal disturbance, remediation actions such as targeted weed spraying appear to be effective in mitigating seasonal outbreaks of weeds.

It was previously recommended that the MTW LDP stream health channel stability monitoring site be relocated for future monitoring. Site MTW LDP2 was established in a section of 'natural' channel around 50m downstream from the former survey site MTW LDP, contained in a more appropriate location capable of detecting potential erosion and deposition events resulting from stream flows. The CSIRO ESA and RARC assessments returned ratings of *Average* and *Potentially Stabilising*, which were consistent with those recorded at former site MTW LDP.

In summary, the MTW 2024 Stream Health and Channel Stability monitoring results underscore the resilience of riparian and channel systems despite ongoing pressures from erosion and changing conditions. Continued management interventions, including the control of invasive species, erosion mitigation and stream health monitoring are recommended to further enhance site stability and ecological condition over time.

6.8.2 Groundwater Management

Groundwater monitoring activities were undertaken in 2024 in accordance with the MTW Water Management Plan and groundwater monitoring program. The monitoring results are used to establish and monitor trends in physical and geochemical parameters of surrounding groundwater potentially influenced by mining.

The groundwater monitoring program at MTW measures the quality of groundwater against background data, EIS predictions and historical trends. Groundwater quality is evaluated through the parameters of pH, EC, and standing water level. A comprehensive suite of analytes are measured on an annual basis, including major anions, cations and metals.

Groundwater monitoring data is reviewed on a quarterly basis. The review involves a comparison of measured pH and EC results against internal trigger values (5th and 95th percentile) which have been derived from the historical data set. The response to results outside the trigger limits is detailed in the MTW Water Management Plan.

The monitoring locations are shown in **Figure 36** and the annual Ground Water Review report can be found in **Appendix 6.**

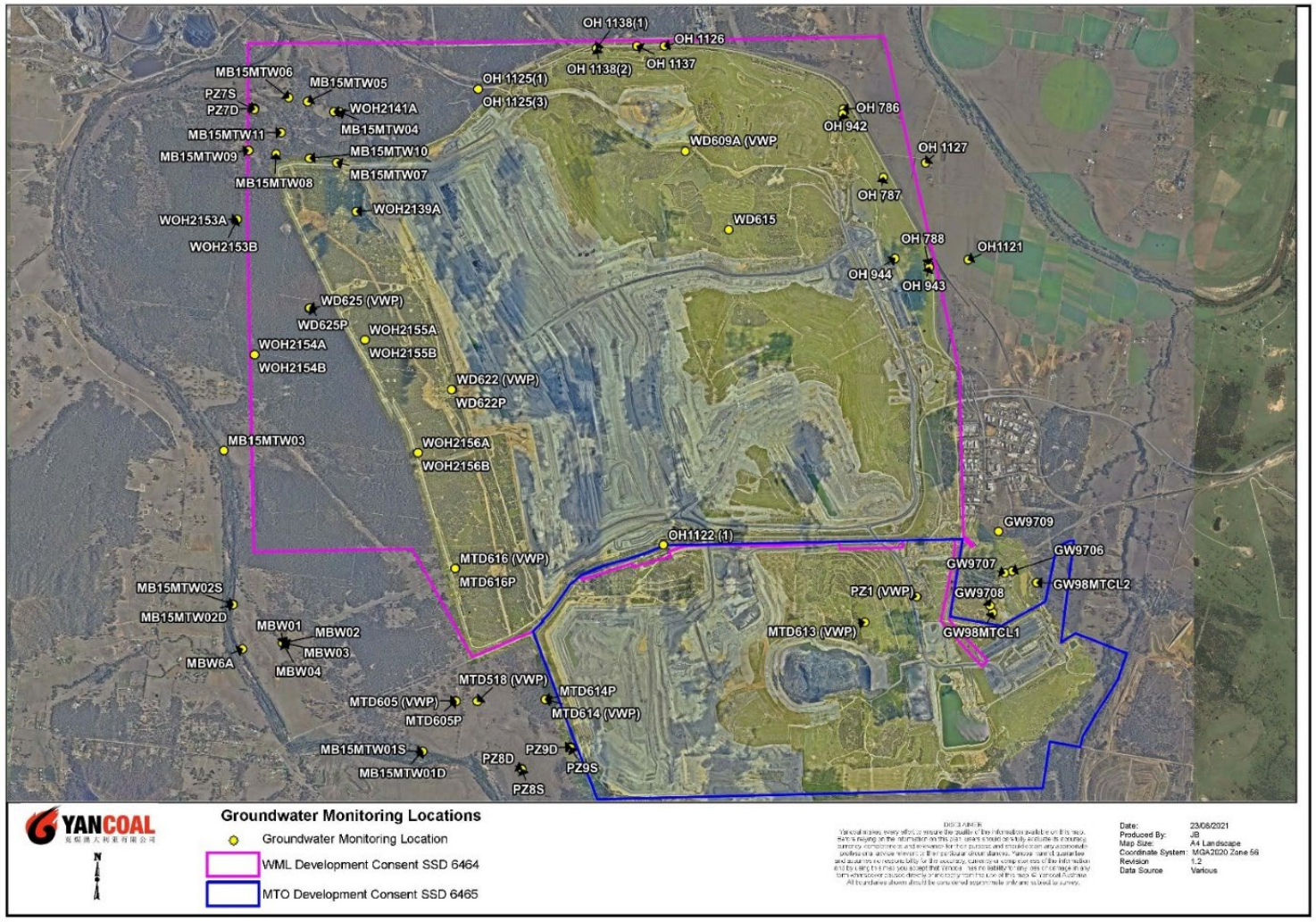


FIGURE 36: GROUNDWATER MONITORING NETWORK AT MTW IN 2024

6.8.3 Groundwater Performance

Sampling of ground waters was carried out on 408 occasions from 60 bores across MTW in accordance with AS/NZS 5667.6 (1998). Where laboratory analysis was undertaken, this was performed by a NATA accredited laboratory. Groundwater sampling and analysis was undertaken as required with the following exceptions detailed in **Table 6.14**.

TABLE 6.14 MTW WATER MONITORING DATA RECOVERY FOR 2024 (BY EXCEPTION)

Location	Data Recovery (%)	Comment
OH787	75%	No safe access in March.
OH943	0%	Insufficient water in March and obstruction in bore in June, September and December.
OH1122 (1)	0%	Insufficient water for sampling in 2024.
OH1125 (1)	25%	Insufficient water for sampling in June, September and December.
OH1125 (3)	0%	Insufficient water for sampling in 2024.
OH1127	0%	Obstruction in bore unable to sample in 2024.
WOH2139A	0%	Decommissioned due to mine progression.
WOH2154A	50%	No safe access in May and August.
MTD616P	0%	Decommissioned due to mine progression.
WD616P	0%	Decommissioned due to mine progression.
WD622P	0%	Decommissioned due to mine progression.
WOH2154B	50%	No safe access in May and August.
MB15MTW04	25%	Insufficient water for sampling in May, August and November.
MB15MTW05	25%	Insufficient water for sampling in May, August and November.
MB15MTW07	25%	Insufficient water for sampling in May, August and November.
MB15MTW08	25%	Insufficient water for sampling in May, August and November.
MB15MTW09	25%	Insufficient water for sampling in May, August and November.
MB15MTW10	25%	Insufficient water for sampling in May, August and November.
MB15MTW11	25%	Insufficient water for sampling in May, August and November.
OH944	0%	Insufficient water for sampling in 2024.

6.8.4 Annual Ground Water Review

Groundwater monitoring results are reviewed against the trigger limits within MTW's approved Water Management Plan on a quarterly basis by MTW. A comparison of the water quality information across MTW's monitoring bore network is provided graphically in **Appendix 6.** The approved trigger limits are based on the historical water quality data as shown in the relevant site Environmental Impact

Assessments. These trigger limits are updated annually based on collected site data as described in the MTW Water Management Plan. A summary of the management actions taken in response to any exceedances of the trigger limits during the period is provided in the Monthly Environmental Monitoring Reports, available via MTW's website (https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mgt-docs).

An annual groundwater review was undertaken by an independent groundwater consultant (Australasian Groundwater and Environmental Consultants Pty Ltd). The scope of the review included an assessment of the water quality and groundwater levels recorded during the 2024 reporting period as well as a review of the historical results against the predictions in the site groundwater model. A copy of the full report is included in **Appendix 6.**

Key findings from the independent groundwater consultant's report were:

- Groundwater level in coal seams in the Western down-dip depressurised zone generally declined or remained stable during the 2024 monitoring period.
- Groundwater levels in shallow overburden monitoring bores underlying the Wollombi Brook alluvium and Warkworth Sands typically declined or remained stable during the 2024 monitoring period. Minimal interaction between the Wollombi Brook alluvium and the shallow overburden is evident.
- Groundwater level in coal seams eastward and up-dip of mining recorded variable results during 2024. Bayswater monitoring bores were typically stable, whilst groundwater levels in Vaux and Warkworth coal seam bores decreased during the monitoring period.
- Groundwater level in Hunter River alluvial bores were stable or slightly increased during 2024. Boreholes OH942 and OH788, saw a notable, rapid increase in water level during the last two quarters of 2024. The exceptions were OH786, which recorded continuing fluctuating groundwater levels and OH787, which recorded stable water levels during 2024.
- Groundwater level in Wollombi Brook alluvium monitoring bores first increased and then decreased during the year. Groundwater levels in all Wollombi Brook alluvium monitoring bores correlate strongly with the Cumulative Rainfall Departure (CRD), indicating no mining related impacts.
- Groundwater level in Warkworth Sands monitoring bore PZ7S steadily declined during the 2024 monitoring period, correlating closely with CRD trends.
- Multiple pH trigger exceedances were recorded in the shallow overburden monitoring bore MB15MTW01D in 2024. The four consecutive trigger exceedances in MB15MTW01D (in February, May, August and November) indicate an exceedance and relate to the lower pH trigger level (6.9). Previous trigger exceedances for pH in MB15MTW01D were investigated (AGE, 2022) and concluded that inappropriate trigger values were the likely cause of the trigger exceedances.
- Trigger exceedances for pH were recorded in monitoring bore WOH2156B monitoring the Wambo seam. Values below the lower trigger threshold of 6.9 were observed during all four monitoring periods of 2024 (in February, May, August and November).

- A single trigger exceedance for pH (7.3) was recorded during Q4 at borehole OH1137 (monitoring the Vaux seam), exceeding the upper trigger value of 7.2. pH observations collected during the previous three monitoring periods of 2024 were within trigger thresholds.
- Two consecutive trigger values for pH were recorded in borehole PZ9S (monitoring the Wollombi Brook Alluvium) during Q2 and Q3 monitoring (June and October). pH readings for Q1 and Q4 (March and December) were both equal to the upper trigger level of 7.0.
- 2024 groundwater pH measurements in PZ7S were below the lower trigger threshold during Q1 and Q2. The pH reading increased during Q3 monitoring, but again exceeded the lower trigger threshold during Q4 monitoring.
- Hunter River Monitoring bore OH787 recorded a single reading above the trigger threshold for groundwater EC during Q1 (March). This reading of 19,400 µS/cm was only marginally above the trigger threshold 19,351 µS/cm.
- Warkworth seam monitoring bore OH1138(1) recorded one groundwater EC reading in April that was above trigger thresholds in 2024. Previous and subsequent readings during 2024 all remained below the trigger threshold.
- VWP sensors installed into the Bayswater coal seam recorded declining results during the 2024 monitoring period. Sensors in WD625 and MTD605 recorded declining pressure heads throughout the year and pressure heads in MTD613 began to show a heavily declining trend during 2024; which is the reversal of that noted during the 2023 reporting period. No pressure head data was available for VWPs MTD616, WD622 and WD615 for the 2024 period.
- VWP pressure head in sensors installed into the Mt Arthur coal seam slightly declined during the 2024 monitoring period. The exception being sensors in MTD616 and MTD615, for which there are no data for the monitoring period.
- Sensors installed into Woodlands Hill coal seam recorded decreasing pressure heads during 2024.
- There were no VWP data available from sensors in the Wambo coal seam for 2024. Data from the sensor installed into the Wambo coal seam at VWP MTD518 indicates the sensor has likely failed.
- Pressure head declined in VWP sensors in the Vaux coal seam for 2024 (MTD605, MTD616 and WD625). The sensor in the Vaux seam in bore MTD605 had not been reading since 2019 but began to record data at the beginning of 2024.
- Whybrow coal seam VWP sensor pressure heads remained relatively stable during the 2024 monitoring period; no data from borehole MTD616 was available this period.
- VWP pressure heads in the Glen Munro seam (at MTD614) showed a slightly increasing trend during 2024.
- VWP pressure heads in the Blakefield seam (at MTD605) were stable during 2024.
- VWP pressure heads in the Piercefield seam (at WD615) were stable during 2024.
- PZ1 calibration factors weren't available. Calibration factors should be located so that PZ1 can be reviewed in future reports.
- Observed groundwater level trends generally correlate with modelled predictions. The exceptions being Blakefield seam bore OH1122(1) in which observed groundwater levels are >35 m higher than model predictions, a weak correlation between modelled and observed

level data in Bowfield seam monitoring bores, and GW98MTCL2 which exhibits disparity between observed data and modelled data in excess of 10 m. WOH2156B displays a relatively stable groundwater level in comparison to modelled predictions, but since late 2023 has begun to show a higher degree of variability when compared to the model, exhibiting significant decline in 2024. Typically, observed pressure heads in VWPs do not strongly align with modelled predictions. There are no modelled data for bores constructed after 2015.

- It is assumed that the following bores have been decommissioned: WOH2139A, MTD616P, and WD622P

Key recommendations from the independent groundwater consultant's report include:

- An investigation should be undertaken to determine the cause of pH trigger exceedances in WOH2156B.
- Calibration factors for VWP PZ1 should be determined so that pressure head trends can be discussed in future annual reviews.
- Mount Arthur, Bowfield and Vaux seam VWP sensor cables should be inspected in MTD614 for damage to determine if erroneous data is due to a poor connection to the logger.
- Vaux seam sensor in MTD605 and Wambo seam sensor in MTD518 should be inspected for damage to determine if missing (MTD605) and erroneous (MTD518) data is due to a poor connection to the logger.
- Undertake remediation actions at OH1127 (blocked by pump), MB15MTW11 (confirm bore is blocked); and WD615 should be relocated (logger unit has not recently been located).
- Survey data (coordinates and top of PVC mAHD) should be obtained for bores MB15MTW01 through MB15MTW11, and MBW06A.
- Consider installing a new monitoring bore to monitor the Bowfield seam. The last remaining monitoring bore for this section OH1125(3) went dry during 2022.
- Consider updating the groundwater model to incorporate newly constructed monitoring installations and to better model existing monitoring installations.

MTW will assess and progress the recommendations of the groundwater consultant for the 2024 reporting period including completion of investigation into instances of trigger exceedances, as per MTW's Water Management Plan.

6.8.5 Compensatory Water Supply

Under the *Water Management Act 2000*, there are three types of basic landholder rights in NSW:

- **Domestic and stock rights** - Owners or occupiers of land overlaying an aquifer or with river, estuary or lake frontage can take water without a licence for domestic (household) purposes or for stock watering.
- **Harvestable rights** - Harvestable rights allows landholders to capture and store a proportion of the rainfall runoff from their landholding in one or more harvestable rights dams without requiring a water access licence, water supply work approval, or water use approval.
- **Native title** - Anyone who holds native title with respect to water, as determined under the Commonwealth Native Title Act 1993, can take and use water for a range of personal, domestic and non-commercial purposes.

MTW is required by development consent conditions to provide compensatory water supply to the owner of any privately owned land whose basic landholder water rights (as defined in the *Water Management Act 2000*) are adversely and directly impacted as a result of the development.

During the 2024 reporting period there was no need for compensatory water supply to be provided to others as a result of the developments.

6.9 Waste

6.9.1 Management

The management of waste generated on the MTW site is undertaken in accordance with the site MTW non-mineral waste management strategy which is designed to;

- track and record all wastes leaving the site to meet all regulatory requirements; and
- implement appropriate segregation, collection, handling, transport and disposal of waste in a way which minimises the impacts on the environment.

All waste not suitable for reuse on site is removed by a licensed waste contractor and disposed of or recycled accordingly at licensed waste management facilities within the local Hunter region. Appropriate segregation is implemented across various waste streams at MTW to maximise diversion from landfill and minimise the impact to the environment by recycling or reuse. Some waste categories are processed and disposed of on the MTW site, as per NSW EPA exemption approvals, set out in the MTW Environment Protection Licenses. The effluent treatment and disposal facilities at MTW consist of sewage treatment plants which treat, disinfect and dispose, or re-use the treated effluent on site. All waste management contractors engaged for waste collection, handling and transportation at MTW are licensed by the NSW EPA.

6.9.2 Performance

During the reporting period MTW continued to undertake regular inspections of areas where wastes are generated and stored, to reinforce the principles of a considerate waste management approach including waste stream segregation to increase material recycling and promote diversion from landfill. In 2024, 79% of all non-mineral waste generated and removed from MTW was diverted from landfill and processed at licensed recycling and secondary use facilities. The remaining 21% was disposed of as end-of-life waste at a local licensed landfill facility. There were no community complaints or regulatory non-compliance notices receiving in 2024, in relation to waste management during the reporting period.

7 LAND MANAGEMENT

7.1 Summary of Rehabilitation

A total of 100.6ha of new rehabilitation (rehabilitation progressed to Ecosystem and Land Use Establishment phase) was completed during 2024 which was 19.4ha more than the Forward Program 2024 target of 81.2ha. Total disturbance undertaken in 2024 was 65.4ha against a Forward Program target of 78.7ha. This disturbance included 11.8ha of rehabilitation disturbance. The lower amount of disturbance was due to disturbance ahead of mining being delayed in West Pit and North Pit.

The 2014 Environmental Impact Statements for the Warkworth Continuation Project and the Mt Thorley Continuation Project modelled MTW's progress with mining and rehabilitation in indicative mine plans at different stages over the course of MTW executing it's operations. These documents modelled a total of 1,607.8 ha of rehabilitation completion by the end of 2023. At the end of the 2024 reporting period there had been 1,470.0 hectares of rehabilitation completed across Warkworth and Mount Thorley, which is 137.8ha less than predicted in the indicative EIS forecast for the end of 2023.

An Annual Rehabilitation Report has been prepared to meet the requirements of the Standard Conditions for Mining Leases. The Annual Rehabilitation report has been provided in **Appendix 7** of this report.

7.2 Weed Control

7.2.1 Weed Treatment

The weeds identified at MTW occur primarily in areas that have been disturbed such as post mining rehabilitation areas, previous civil works areas, soil stockpiles, water management structure surrounds, and general areas of minor ground disturbance. The weed control associated with rehabilitation maintenance is detailed in the Annual Rehabilitation Report (**Appendix 7**). In addition to the rehabilitation maintenance, a total of 63 days of weed management work was undertaken on site at MTW during 2024, with 113 ha of land treated, including maintenance of access tracks and environmental monitoring points. The weeds targeted during the 2024 weed management programme were based on the results of the 2023 weed survey. **Figure 37** illustrates the target species and weed treatment areas across MTW. Weed treatment areas are assessed following the completion of periods of work to determine the effectiveness of control works.

The species focussed on during treatment included:

- African boxthorn *(Lycium ferocissimum)*
- African olive *(Olea europaea)*
- Castor oil plant *(Ricinus communis)*
- Fireweed *(Senecio madagascariensis)*

- Green cestrum *(Cestrum parqui)*
- Inkweed *(Phytolacca octandra)*
- Juncas *(Juncus acutus)*
- Lantana *(Lantana camara)*
- Mother of millions *(Bryophyllum delagoense)*
- Narrow-leaf cotton bush (*Gomphocarpus fruticosus*)
- Noogoora burr *(Xanthium occidentale)*
- Prickly pear species *(Opuntia spp)*
- Rhodes grass *(Chloris gayana kunth)*
- Golden wreath wattle *(Acacia saligna)*
- Stinking roger *(Tangetes minuta)*

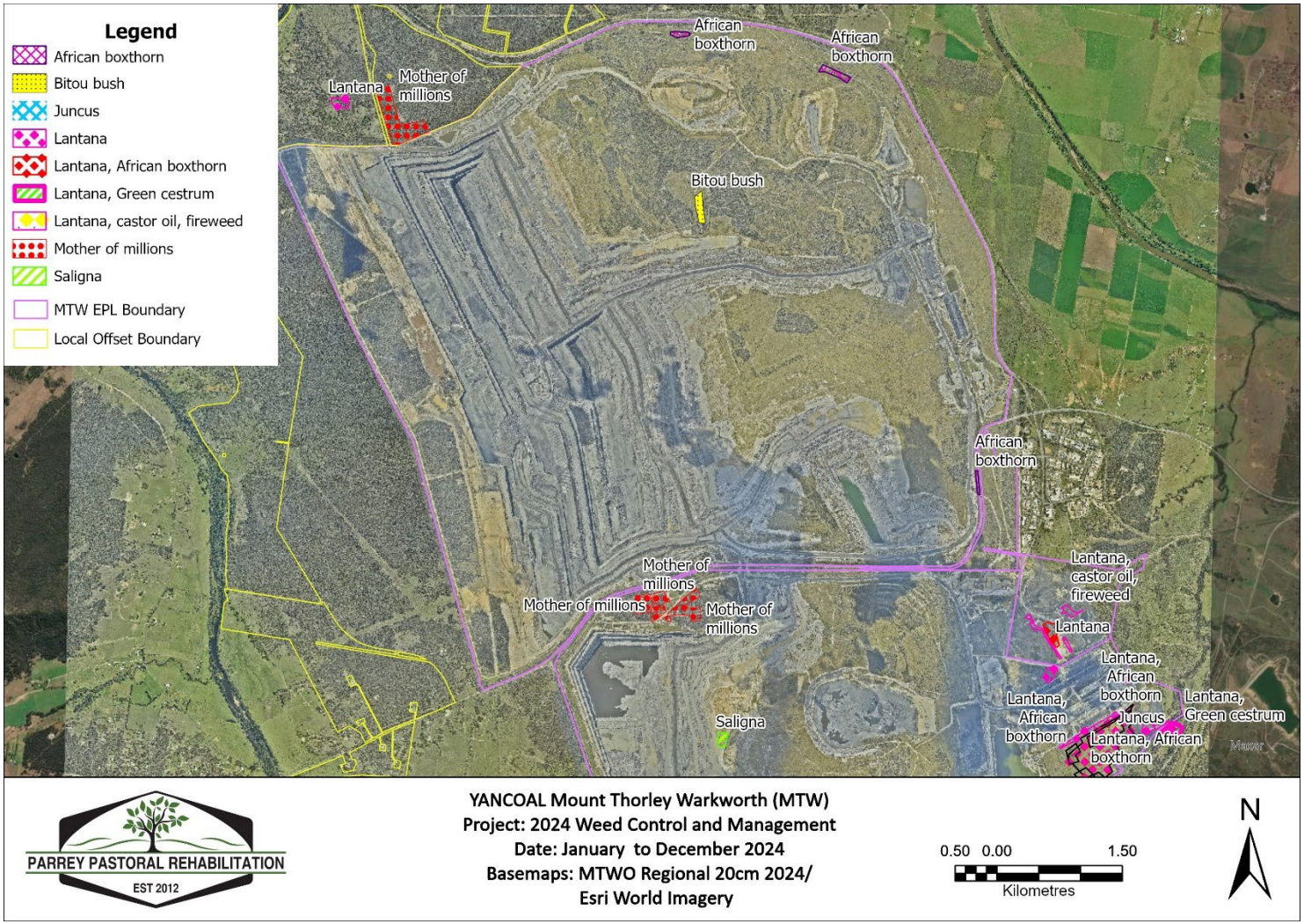


FIGURE 37: ANNUAL WEED CONTROL OVERVIEW FOR 2024

7.2.2 Annual Weed Survey

The management and control of weeds at MTW is governed by the Annual Weed Survey (AWS). The AWS lists Weeds of National Significance (WONS), noxious, environmental and other non-declared weed species identified across MTW and provides a framework to allow for structured weed management and control across operational and non-operational areas of MTW.

The following summarises the results of the weed survey undertaken during December 2024 and is based upon the NSW Biosecurity Act 2015 which came into force from 1 July 2017 and repealed 14 Acts including the Noxious Weeds Act 1993. The new legislation has resulted in the development of the Hunter Regional Strategic Weed Management Plan (2017-2022 and subsequently 2023-2027), which covers the area occupied by MTW.

Five WONS were identified during the survey (including various pear species), including:

- African boxthorn *(Lycium ferocissimum)*
- Bitou bush *(Chrysanthemoides monilifera subsp rotundata)*
- Fireweed *(Scenecio madagascariensis)*
- Lantana *(Lantana camara)*
- Pear species (*Opuntioid Cacti, Opuntia humifusa, Opuntia stricta, Optunia aurantiaca)*

Twelve other priority weeds were identified at MTW during the survey, including:

- African lovegrass *(Eragrostis curvula).* Regional – Asset protection
- Blue heliotrope *(Heliotropium amplexicaule).* Regional – Asset protection
- Castor oil plant *(Ricinus communis).* General biosecurity duty
- Fleabane *(Conyza bonariensis).* General biosecurity duty
- Galenia *(Galenia pubescens).* Regional – Containment
- Golden dodder (*Cuscuta campestris*). General biosecurity duty
- Green cestrum *(Cestrum parqui).* Regional - Asset protection
- Mother of millions *(Bryophyllum delagonese).* Regional - Asset protection
- Scotch thistle *(*Onopordum acanthium*).* General biosecurity duty
- Spiny Rush *(Juncas acutus)*. General biosecurity duty
- St John's Wort *(Hypericum perforatum).* Regional – Containment
- Telegraph weed (*Heterotheca grandiflora*). Regional – Asset protection

Eleven weeds that are not officially declared or listed were also recorded at MTW including:

- Blackberry nightshade *(Solanum nigram)*
- Golden wreath wattle *(Acacia saligna)*
- Inkweed *(Phytolacca octandra)*
- Mustard weed *(Sisymbrium sp.)*
- Narrow leaved cotton bush *(Gomphocarpus fructicosus)*
- Noogoora burr *(Xanthium occidentale)*
- Paddy's lucerne *(Sida rhombifolia)*

- Purpletop *(Verbena bonariensis)*
- Rhodes grass *(Chloris gayana kunth)*
- Stinking roger *(Tangetes minuta)*
- Tree tobacco *(Nicotiana glauca)*

Species identified during the 2024 survey will form the basis of ongoing weed management works during 2025.

7.3 Vertebrate Pest Management

As part of MTW's vertebrate pest management activities a baiting programme is carried out on a seasonal basis. Two 1080 ground baiting programmes consisting of approximately 55 bait sites utilising meat baits were undertaken during autumn and spring to target wild dogs and foxes. Baits were checked over a three-week period and replaced each week when taken. The programmes were undertaken in conjunction with neighbouring landholders where possible.

Table 7.1 summarises the results from the programmes carried out at MTW during 2024 with baiting locations and results for the programmes are illustrated in **Figure 38** and **Figure 39**.

TABLE 7.1 VERTEBRATE PEST CONTROL SUMMARY

Season	1080 Baiting			
	Total Lethal Baits Laid	Takes by Wild Dog	Takes by Fox	Takes by Feral Pigs
Autumn	107	55	14	0
Spring	98	4	56	0
Total	**205**	**59**	**70**	**0**

Additional pest management programmes included a feral pig trapping and baiting programme carried out across MTW in Winter that resulted in 83 feral pigs controlled (which includes an estimate of 12 pigs from the baiting programme). MTW will continue to carry out vertebrate pest control programmes during 2025 to limit feral pest impacts on landholdings and surrounding neighbours.

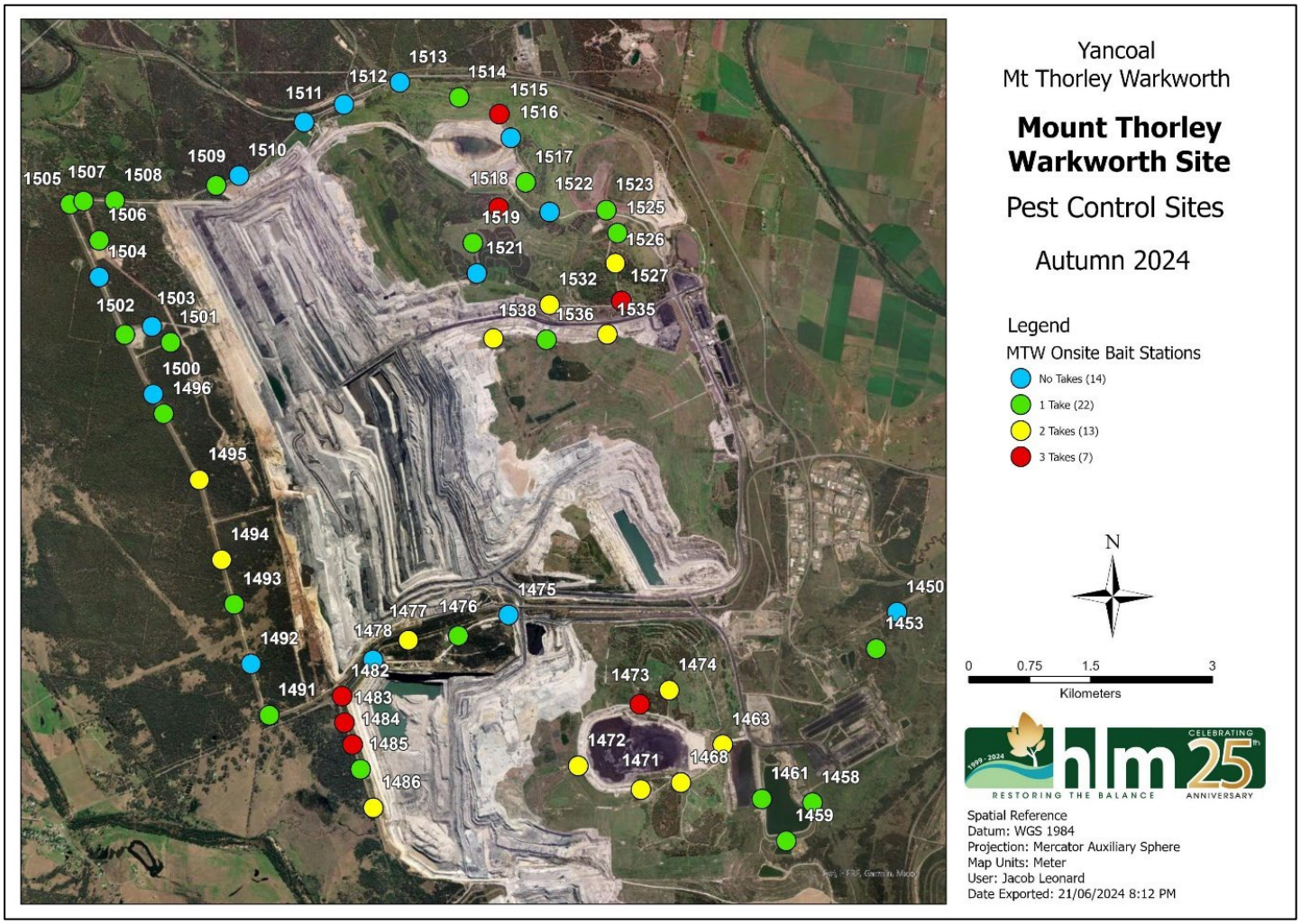


FIGURE 38: BAITING STATION LOCATIONS AND RESULTS AT MTW DURING AUTUMN 2024 VERTEBRATE PEST MANAGEMENT PROGRAMME

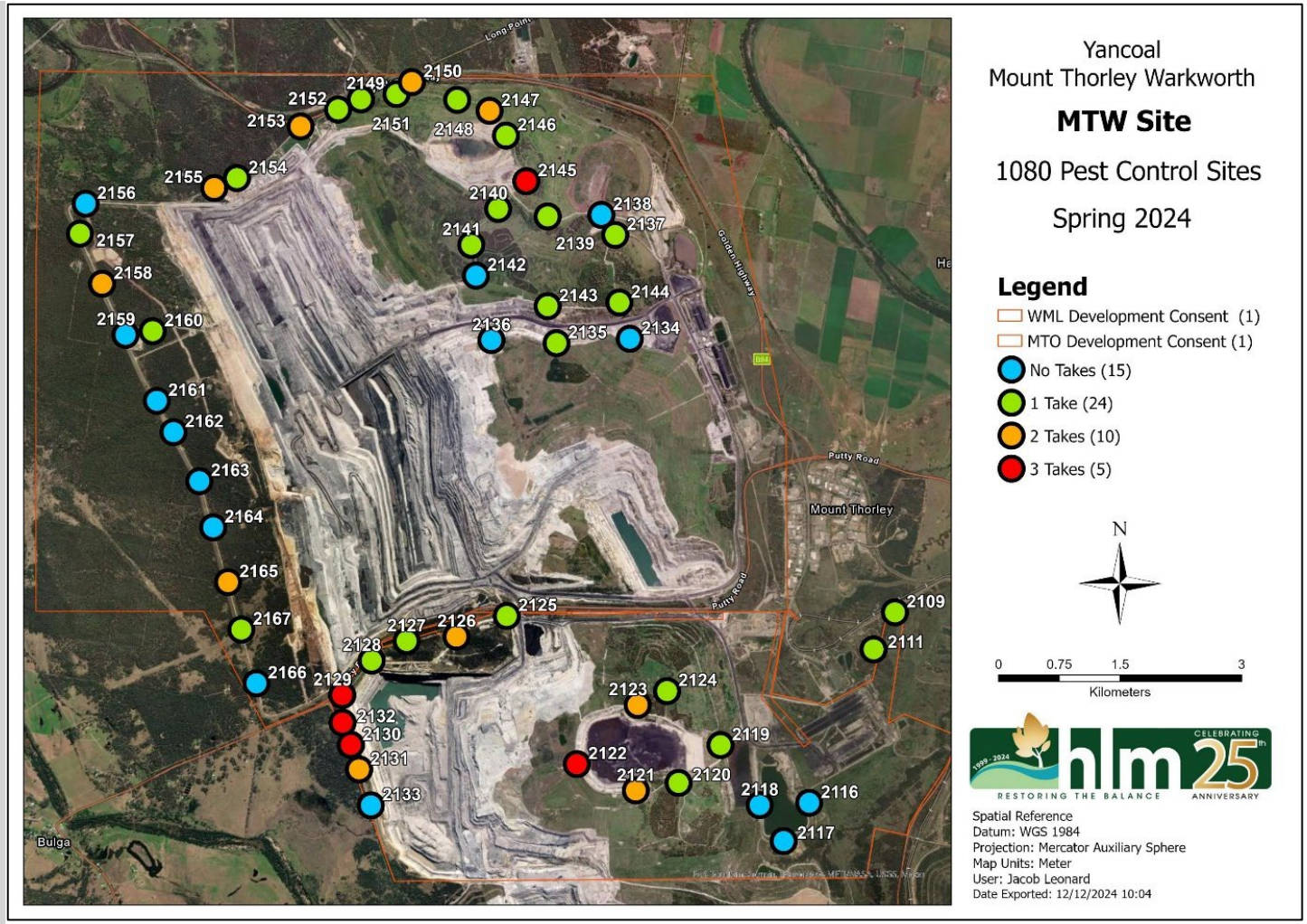


FIGURE 39: BAITING STATION LOCATIONS AND RESULTS AT MTW DURING SPRING 2024 VERTEBRATE PEST MANAGEMENT PROGRAMME

7.4 Biodiversity Offsets

7.4.1 Management

MTW's impacts on biodiversity values are offset through the protection and management of Biodiversity Areas (BAs). The BA's that are related to MTW illustrated in **Figure 40** and also listed in **Table 7.2**.

TABLE 7.2 MTW BIODIVERSITY AREAS

Biodiversity Areas	Area (ha)	Environmental Approvals				Offset Feature/s
		State		Federal		
		NSW 2003	NSW 2015	EPBC 2002/629	EPBC 2009/5081	
Southern	986	211	775		94	Warkworth Sands Woodland; Central Hunter Grey Box – Ironbark Woodland; Habitat for Swift Parrot, Regent Honeyeater, Southern Myotis and Large-eared Pied Bat.
Northern	341	39	302		341	Warkworth Sands Woodland; Central Hunter Grey Box – Ironbark Woodland; Habitat for Swift Parrot, Regent Honeyeater, Southern Myotis and Large-eared Pied Bat.
North Rothbury	41		41		41	North Rothbury Persoonia
Goulburn River (MTW Portion)	1,066		1,066	1,066		Central Hunter Valley Eucalypt Forest (CHVEF); Ironbark/Stringybark Communities; Box shrubby/grassy Woodlands; Habitat for Swift Parrot and Regent Honeyeater
Bowditch	602		602	520	82	CHVEF; Ironbark/Stringybark Communities; Habitat for Swift Parrot and Regent Honeyeater
Putty	383				383	CHVEF; Habitat for Swift Parrot and Regent Honeyeater
Seven oaks	519				519	CHVEF; Habitat for Swift Parrot and Regent Honeyeater
Condon View (MTW Portion)	345				345	CHVEF; Habitat for Swift Parrot and Regent Honeyeater

The MTW BA's are managed in accordance with site specific Offset Management Plans (OMPs). All of the OMPs are available on MTW's website.

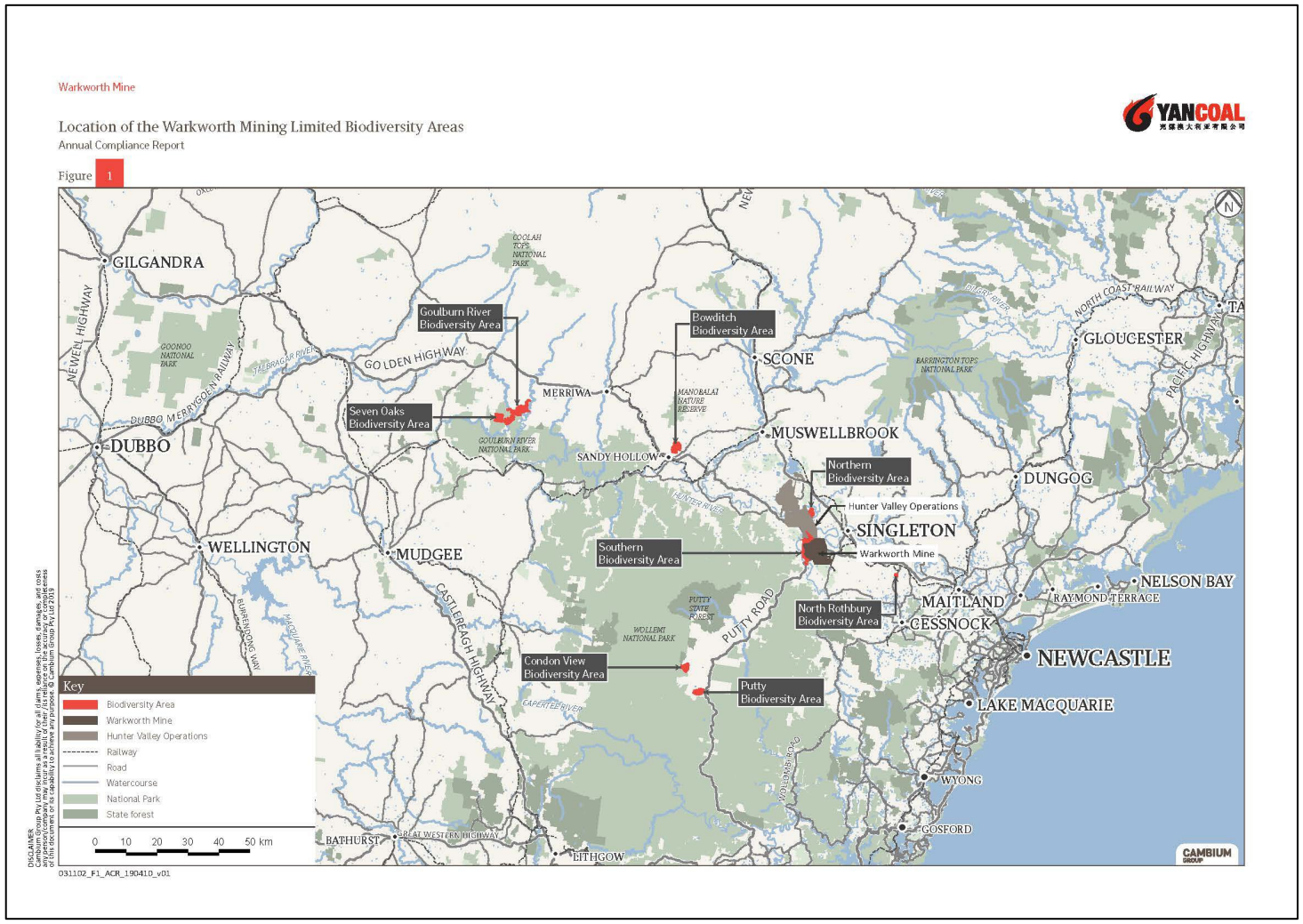


FIGURE 40: MTW BIODIVERSITY OFFSET LOCALITY MAP

7.4.2 Permanent Protection

MTW submitted an administrative modification to NSW development consent SSD-6464 on 29 April 2021 (MOD1) to clarify biodiversity offset requirements for the Warkworth Continuation Project and to facilitate in-perpetuity conservation of biodiversity offset land. Department of Planning, Housing and Infrastructure (DPHI) in consultation with Biodiversity, Conservation and Science (BCS) advised that a Biodiversity Stewardship Agreement (BSA) is the only mechanism acceptable to the NSW Government for in-perpetuity security of biodiversity offset land. The establishment of a BSA requires biodiversity offset credits to be retired. Biodiversity offset credits for the MTW offset land were determined under prior mechanisms and are not equivalent to the current Biodiversity Assessment Method (BAM) credits required for a BSA. MTW is working with Conservation Programs, Heritage and Regulation (CPHR) (formerly BCS) and DPHI to progress BSAs for the offset land areas. The administrative modification to NSW development consent SSD-6464 will be withdrawn upon completion of the BSAs.

7.4.3 Biodiversity Area Management Activities

The OMPs describe the Conservation Management Strategies. The following are the key actions completed throughout 2024 across all the BAs:

7.4.3.1 Weed Control

Weed control at the Local BAs targeted the following species:

- African boxthorn (*Lycium ferocissimum)*
- African lovegrass *(Eragrostis curvulva)*
- African olive (*Olea europaea)*
- Aloe vera *(Aloe barbadense)*
- Balloon vine *(Cardiospermum grandiflorum)*
- Bidens (*Bidens pilosa)*
- Black locust *(Robinia pseudoacacia)*
- Blackberry nightshade *(Solanum nigrum)*
- Blue heliotrope *(Heliotropium amplexicaule)*
- Brazilian nightshade (*Solanum seaforthianum)*
- Brome grass *(Bromus catharticus)*
- *Cats claw creeper (Dolichandra unguis-cati)*
- Common evening primrose *(Oenothera biennis)*
- Coolatai grass (*Hyparrhenia hirta)*
- Couch grass *(Elymus repens)*
- Creeping pear *(Opuntia humifusa)*
- European olive *(Olea europaea)*
- Fireweed *(Senecio madagascariensis)*
- Galenia (*Galenia pubescens)*
- Golden wreath wattle (*Acacia saligna)*
- Green cestrum (*Cestrum parqui)*
- Inkweed (*Phytolacca octandra)*
- Lantana *(Lantana camara)*
- Lily of the Nile (*Agapanthus sp.*)

- Mother of millions (*Bryophyllum delagoense),*
- Moth vine (*Araujia sericifera)*
- Paterson's curse (*Echium plantagineum)*
- Potato vine *(Solanum seaforthianum)*
- Prickly pear (*Opuntia stricta)*
- Rhodes grass *(Chloris gayana)*
- Rye grass *(Lolium sp.)*
- Silky oak *(Grevillea robusta)*
- Silverleaf nightshade *(Solanum elaeagnifolium)*
- Stinking roger (*Tagetes minuta)*
- Teddy bear vine *(Cyanotis beddomei)*
- Telegraph weed *(Heterotheca grandiflora)*
- Toadflax *(Linaria vulgaris)*
- Tree of Heaven *(Ailanthus altissima)*
- Turkey rhubarb *(Rumex sagittatus)*
- Wild oats *(Avena fatua)*
- Vipers bugloss (*Echium vulgare)*

Weed control at the Regional BAs targeted the following species:

- African boxthorn (*Lycium ferocissimum*)
- African lovegrass *(Eragrostis curvulva)*
- African olive *(Olea europaea)*
- Blackberry *(Rubus fruticosus)*
- Blue heliotrope *(Heliotropium amplexicaule)*
- Bridal creeper *(Asparagus asparagoides)*
- Cadaghi *(Corymbia torelliana)*
- Castor oil *(Ricinus communis)*
- Cats claw creeper *(Dolichandra unguis-cati)*
- Common ragwort *(Senecio jacobaea)*
- Cootamundra Wattle *(Acacia baileyana)*
- Creeping pear *(Opuntia humifusa),*
- Fireweed *(Scenecio madagascariensis)*
- Green cestrum *(Cestrum parqui)*
- Grevillea *(Grevillea robusta)*
- Jacaranda *(Jacaranda mimosifolia)*
- Lantana *(Lantana camara)*
- Narrow-leaf cotton bush *(Gomphocarpus fruticosus)*
- Paterson's curse *(Echium plantagineum)*
- Prickly pear *(Opuntia stricta)*
- Queensland Wattle *(Acacia podalyriifolia)*
- Robinia *(Robinia pseudoacacia)*
- St John's wort *(Hypericum perforatum)*
- Sticky nightshade *(Solanum sisymbriifolium),*

- Trad *(Tradescantia fluminensis)*
- Tree of heaven *(Ailanthus altissima)*
- Whiskey grass *(Andropogon virginicus)*
- Willows *(Salix sp.)*
- Yucca *(Yucca aloifolia)*

7.4.3.2 Infrastructure Management and Improvement

In 2024 fence repair and replacement was undertaken at the Southern, North Rothbury and Goulburn River BAs. Tracks were maintained to reduce encroaching vegetation and improve access. Regular property inspections were undertaken on all BAs.

7.4.3.3 Fire Management

Slashing of fire breaks was undertaken on the Southern, Northern, North Rothbury and Goulburn River BA's. A Hazard Reduction Burn for North Rothbury BA was approved however conditions were outside the prescribed limits, so the burn was rescheduled for 2025.

Overall fuel load assessments were undertaken on all offsets.

7.4.3.4 Strategic Grazing

No strategic grazing was undertaken in the BAs in 2024.

7.4.3.5 Vertebrate Pest Management

Two 1080 ground baiting programmes targeting wild dogs and foxes were undertaken across the Local and Regional Biodiversity Areas. Baits were checked over a three-week period and replaced each week when taken. Baiting was carried out in autumn and spring and was undertaken in conjunction with neighbouring landholders where possible. **Table 7.3** summarises the results from the programmes during 2024.

TABLE 7.3 SUMMARY OF VERTEBRATE PEST MANAGEMENT 2024

Season	1080 Baiting				
	Total Lethal Baits Laid	Takes by Wild Dog	Takes by Fox	Takes by Feral Pigs	Takes by other/unknown
Autumn (Local BAs)	72	26	7	5	1
Spring (Local BAs)	92	4	57	2	5
Autumn (Regional BAs)	194	41	76	5	8
Spring (Regional BAs)	196	39	67	2	45
Total	**554**	**110**	**207**	**14**	**59**

Additional pest management programmes included:

- A ground shooting programme at the Goulburn River BA in March controlled two cats, one fox, two rabbits and one hare.
- A ground shooting programme at the Seven Oaks Biodiversity Area in March controlled 20 rabbits, one feral pig, one fox and two feral cats.
- A ground shooting programme at the Bowditch Biodiversity Area in March controlled five feral deer, one fox and one rabbit.
- A ground baiting programme at the Northern Biodiversity Area in April controlled up to 11 feral pigs.
- Aerial shoot conducted by National Parks and Wildlife Service at the Goulburn River and Seven Oaks BAs in April and September controlled 15 feral pigs.
- Noisy Miner ground shoots were undertaken at the Goulburn River BA and the Bowditch BA in July and August under a Licence to Harm Protected Animals (Biodiversity Conservation Act 2016). The programmes aim to assist the survivability of the Regent Honeyeater. The Goulburn River BA programme, which is its eighth consecutive year, resulted in the control of 303 Noisy Miners over seven days. The Bowditch BA programme resulted in the control of 55 Noisy Miners over four days. This is the third Noisy Miner programme undertaken on this offset and will likely continue in 2026.
- A pig trapping and baiting program undertaken in July at MTW and the local Biodiversity Areas controlled up to 83 pigs.

Vertebrate pest management programmes will continue to be carried out during 2025 to limit feral pest impacts on landholdings and surrounding neighbours.

7.4.3.6 Seed Collection

Seed collection was not undertaken within MTW's Biodiversity Area's in 2024.

7.4.3.7 Revegetation

MTW has committed to restoring the Endangered Ecological Communities of Warkworth Sands Woodland and Central Hunter Grey Box – Ironbark Woodland in the Southern and Northern Biodiversity Areas. Work commenced in 2014 and overall there is more than 500 hectares of grassland area to be planted and managed over 15 years to restore these Endangered Ecological Communities.

The Warkworth Sands Woodland planting of ~15,100 tube stock at the Northern BA was undertaken in Autumn 2024. This included the relocation and spreading of ~13,000m3 of WSW topsoil sand from mining disturbance areas of the Warkworth Continuation project prior to planting. In 2024, restoration work in the Southern BA included planting 1,460 River Oak Forest and 4,780 Central Hunter Grey-Box Ironbark Woodland species tube stock within Southern Biodiversity Area 5. The Warkworth Sands Woodland planting of 4,000 tube stock at Southern Biodiversity Area 3 was undertaken in May and June 2024. This included the relocation and spreading of ~5,000m3 of WSW topsoil sand prior to planting.



FIGURE 41: WSW PLANTING IN THE SOUTHERN BIODIVERSITY AREA 3



FIGURE 42: CHGBIW PLANTING IN THE SOUTHERN BIODIVERSITY AREA 5



FIGURE 43: WSW PLANTING IN THE NORTHERN BIODIVERSITY AREA

7.5 Monitoring Activities

The Local and Regional Biodiversity Areas Annual Compliance Reports respectively (provided in **Appendix 8**) provide a summary of the monitoring activities undertaken, which are consistent with the requirements of the relevant Biodiversity Management Plans. The sections below provide a summary.

7.5.1.1 Rapid Condition Assessments

The Rapid Condition Assessment technique is used as a preliminary assessment of woodland condition within the BA. Each year the sites in mature and regrowth vegetation are revisited to record the presence or absence of key habitat components and threatening processes. The results of the Rapid Condition Assessment, together with property inspection and plot reference points will be used to monitor woodland condition and identify emerging threats. The 2024 monitoring results showed general maintenance of woodland conditions across all BAs and supports the continued implementation of the conservation management strategies.

7.5.1.2 Bird Assemblages Monitoring

Bird assemblage monitoring is undertaken every two years as part of the ecological monitoring requirements to assess changes in the condition and extent of the woodland habitats within the BAs and the ongoing usage of these habitats by woodland birds.

A total of 258 two-hectare 20-minute bird surveys were conducted during the winter and spring period, to cover the period when swift parrots and regent honeyeaters are most likely to be present on site.

A regent honeyeater was located for the first time on Condon View BA. This was a zoo-bred bird released in the lower Hunter Valley six weeks prior. Between six and ten regent honeyeaters were detected on the Goulburn River BA, where two pairs nested. Regent honeyeaters were recorded in two new areas of the property. No swift parrots were detected occupying the Biodiversity Areas in 2024. A total of 120 species of birds were recorded throughout the eight Biodiversity Areas (BAs) representing an increase of seven species compared to 2022 data. Relative to the 2022 data total bird species richness increased slightly at all Biodiversity Areas except Condon View. Bird abundance measures were more mixed, with slight increases at Putty, Southern and Condon View BA's, slight decreases at North Rothbury and Northern BA and little change at the other three Biodiversity Areas. None of the changes in bird species richness or abundance within Biodiversity Areas were statistically significant relative to 2022.

The results from the 2024 bird assemblage monitoring are presented in the 2024 Annual Report for Local Offsets (in **Appendix 8**). The next bird assemblage monitoring will occur in 2026.

7.5.1.2 Habitat Restoration Monitoring

The habitat restoration monitoring programme assesses the changes in key attributes within the BA through time as grassland communities are restored to woodland. Monitoring was undertaken across all BAs in Spring 2024.

The monitoring demonstrated that vegetation across the BAs is generally stable but in a variable condition with natural regeneration in some locations. Seven Oaks, Goulburn River, Southern and Northern BA require planting to achieve Benchmark scores and all BAs require continued weed management to target priority weeds.

The results from the 2024 Habitat Restoration monitoring are presented in the 2024 Annual Report for Local Offsets (in **Appendix 8**). The next habitat restoration monitoring will occur in 2026.

8 COMMUNITY

8.1 Complaints

A total of 147 complaints were recorded during the reporting period, representing a decrease of approximately 24% compared to 2023. The 147 complaints were registered by approximately 23 people (some complainants remained anonymous), with over 66% of complaints received from 5 individuals. Most complaints were received from residents in the Bulga area. A breakdown of complaints by type is shown in **Table 8.1**.

Blasting, noise and dust remained key concerns for near neighbours during the 2024 reporting period. There has been an increase in complaints regarding noise by ~29% in comparison to 2023. Lighting has also remained a key concern for the community with complaint numbers staying the same compared to 2023.

TABLE 8.1 SUMMARY OF COMPLAINTS BY TYPE FOR 2022 TO 2024

Complaint type	2024	2023	2022
Noise	45	35	47
Blasting	37	35	47
Dust	44	104	4
Lighting	17	17	20
Water	0	0	0
Other	4	2	3
Total	147	193	121

8.2 Review of Community Engagement

8.2.1 Communication

Members of the community are encouraged to contact MTW and engage in a way that suits them. Communication avenues in place to support MTW include:

- MTW free call Community Information Line (1800 727 745), which is advertised regularly in local newspapers and community newsletters;
- Online, via MTW's website (https://www.yancoal.com.au/our-sites/mount-thorley-warkworth/) with information about MTW including approvals documents, public reports, environmental monitoring results, blasting and road closures, and information about the MTW Community Consultative Committee (CCC) including the minutes of CCC meetings;

- MTW maintains a 24 hour freecall environmental hotline (1800 656 892), which allows community members to register a concern or complaint at any time of the day or night, 365 days a year. The hotline is advertised in telephone directories, on the MTW website, regularly in local newspapers, and in MTW publications;
- MTW maintains a Blast Information Line (1800 099 669) which provides information on blasts and road closures, and offers an SMS subscription for road closure information;
- Near neighbour engagement, including proactive visits to neighbours surrounding MTW; and
- MTW also issues correspondence to specific community members who may be affected by certain changes, to inform of upcoming consultation activities and as a feedback mechanism.

A range of consultation and engagement activities have continued in 2024, which included:

- The MTW Social Impact Management Plan was implemented. This plan collates together all commitments that were part of the Environmental Assessment for MTW's Continuation Project process and identifies where the company will undertake actions to mitigate some of the potential impacts in the area. The main topics include:-
    - Voluntary Planning Agreement;
    - Property Agreements Strategy, around acquisition and mitigation rights in the area.
    - Management of properties in and around Bulga that MTW has had to acquire.
    - Conservation funds and how MTW operate these.
    - Support for local Schools
    - Scholarships and Apprenticeships;
    - Acquisition of Commercial Facilities, for example the Bulga Tavern where MTW worked to upgrade this facility to support the business sustainability, and the Bulga Service Station which has continued to operate after acquisition;
    - Ongoing Community Support Program; and
    - the MTW CCC, which is identified as one of the primary communication areas where the company reports back through the CCC on how their business is performing.
- Engagement and consultation with near neighbours to provide project updates at key project milestones and activities, and in response to concerns/queries raised by individual near neighbours;
- MTW are supportive of the Upper Hunter Mining Dialogue School Tours program.

8.2.2 Community Consultation Committee

The MTW CCC met on a quarterly basis to discuss MTW's operations. The Committee is comprised of MTW representatives, community members and other key external stakeholders, including Singleton Council. The MTW CCC minutes were made available on the MTW website (https://www.yancoal.com.au/our-sites/mount-thorley-warkworth/). The community is invited to

visit the MTW website to learn more about the MTW CCC, as well as other aspects of MTW operations and projects.

During the reporting period the CCC members were:

- Dr Col Gellatly - Independent Chair
- Cr Hollee Jenkins - Singleton Council Representative
- Mr Ian Hedley – Community Representative
- Mr Stewart Mitchell – Community Representative
- Mrs Barb Brown – Community Representative
- Mr Denis Maizey – Community Representative (resigned 15 October 2024)
- Mr Neville Hodkinson – Stakeholder Representative - Singleton Shire Healthy Environment Group
- Mr Graeme O'Brien – Community Representative (Alternate)

Company representatives attending the CCC included:

- Mr David Bennett - MTW General Manager
- Mr Gary Mulhearn – MTW Environment & Community Manager
- Mr Joshua van Bezouwen – MTW Environment & Community Advisor

During December 2024, as requested by the Chair after the resignation of a CCC member in October 2024, MTW commenced an advertising campaign seeking nominations for additional CCC members. The advertising campaign comprised newspaper advertisements, and direct letters to near neighbours to MTW. The nomination closing date was 17 January 2025. The outcome will be reported in the 2025 Annual Review report.

8.2.3 Community Support and Development

In 2024, MTW continued its focus on ensuring the long-term sustainability of the communities in which it operates, through the facilitation of community development programmes such as:

- Voluntary Planning Agreement
- Mount Thorley Warkworth Community Support Program

8.2.3.1 Voluntary Planning Agreement

In 2024, MTW continued contributions to the voluntary planning agreement funds required by development consents SSD-6464 and SSD-6465, and as agreed with Singleton Council. During 2024, MTW contributed a further $650,000 excluding GST, bringing total VPA contributions at end of 2024 to $8.5M of the total commitment value of $11M.

Singleton Council operates the Mount Thorley Warkworth VPA Community Committee which discusses the Bulga Community Project Fund component ($6.6M) of the total VPA commitment value ($11M). During 2024, the committee was chaired by Mayor Sue Moore and includes senior staff from Council, community representatives, and a Yancoal representative. In 2024, the Bulga Community

Project Funds provided from the VPA increased to $4.7M of the $6.6M fund total, and there has been $3.03M of funds committed to projects in the Bulga / Milbrodale area from the Bulga Community Project Fund. A summary of approved projects is provided in **Table 8.2.**

TABLE 8.2 MTW VPA BULGA COMMUNITY FUND APPROVED PROJECTS

Approved Project	Project Lead	Allocated Funding
Lockable noticeboard	Singleton Council	$2,000.00
Recreation area improvements and exercise equipment project	Singleton Council	$80,000.00
Bulga Recreation Ground RV dump point	Singleton Council	$60,000.00
Bulga Stock Reserve Plan of Management & Masterplan	Singleton Council	$60,000.00
Bulga Stock Reserve Stage 1 maintenance works	Singleton Council	$46,811.82
Bulga Stock Reserve Stage 2 detailed survey	Singleton Council	$15,000.00
Bulga Stock Reserve Stage 3 Aboriginal cultural study	Singleton Council	$10,000.00
Bulga Stock Reserve – Detailed landscape design	Singleton Council	$20,000
Bulga Stock Reserve Stage 4 detailed design plans	Singleton Council	$25,000
Bulga Stock Reserve – Ecological Restoration Plan	Singleton Council	$34,800
Milbrodale Public School - Welsh's Road sealing 600m	Singleton Council	$517,259.68
Gravel bus U-turn Bay off Welsh's Road	Singleton Council	$17,920
Baiame Caves Access Road	Singleton Council	$36,677.96
Bulga Hall media system and verandah	Bulga Hall Committee	$100,000.00
Bulga Hall additional funding – replacement of hall ceiling	Bulga Hall Committee	$53,000.00
Bulga Hall public wifi network	Bulga Hall Committee	$4,480.64
Bulga Hall additional improvement works	Bulga Hall Committee	$85,000.00
Old Bulga School restoration	Bulga Milbrodale Progress Association	$430,000.00
Electronic message board	Singleton Council	$27,014.00
Wollombi Brook Walking Trail Masterplan and land purchase exploration	Singleton Council	$20,000.00
Milbrodale Public School Yarning Circle	Milbrodale Public School	$3,000.00
Milbrodale Public School storage room renovations	Milbrodale Public School	$22,000.00
Friends of St Mark's Cemetery - replacement fence	Friends of St Marks Cemetery	$17,590.44
Bulga Milbrodale Equestrian Centre Feasibility Study	Bulga Milbrodale Equestrian Centre	$80,000

Approved Project	Project Lead	Allocated Funding
Bulga Tennis Court Refurbishment	Singleton Council	$350,000
Bulga Stock Reserve - Strategic Restoration Plan	Singleton Council	$500,000
Project management incidentals	Singleton Council	$24,000.00
Project Officer resource – 3 year contract	Singleton Council	$390,000.00
	TOTAL ALLOCATED FUNDING	**$ 3,031,554.54**

8.2.3.2 MTW Community Support Program

In 2024 MTW continued implementation of the Yancoal Community Support Program (CSP). The CSP intends to make a genuine positive difference to the communities in which Yancoal operates. Applications for CSP partnerships are formally received once per funding year. MTW considers and supports applications for local donations and sponsorships that have a clear community benefit and are aligned with the CSP guidelines.

The 2024 round of applications were advertised in August-September 2023 and closed 29 Sep 2023. There were 22 applications received, and one additional after closing date. The following organisations / projects supported in 2024 through the CSP are listed in **Table 8.3**.

TABLE 8.3 MTW COMMUNITY SUPPORT PROGRAM PROJECTS

Organisation	Project
Branxton Golf Club	Zero turn mower
Business Singleton	Business Awards and International Womens Day Luncheon
Jerrys Plains School of Arts Hall Inc	Stage Curtains
Miller Park Bowling Club	Acquiring, Replenishing and Rebuilding equipment
Northern Agriculture Association Inc	Singleton Show and Campdraft 2024
Ridin 4 Mates - MHF	Ridin 4 Mates – Mark Hughes Foundation fundraiser
Rotary Club of Singleton on Hunter	Singleton Art Prize 2024
Samaritans Foundation - Diocese of Newcastle	Christmas Lunch in Singleton 2024
Singleton Council	Christmas on John Street 2024 - Fireworks
Singleton Council	Singleton Public Library-School Holidays 2024
Singleton Fire Brigade Social Club	Santa's Lolly Run 2024
Singleton Golf Club - Ladies Sub Committee	Ladies Golf Open Day 2024
Singleton Heights Pre-School Inc	Safe Surfacing around our Sandpit
Singleton Junior Rugby Club	Training equipment update
Singleton Rugby Club	First aid kit and equipment for game day trailer

Organisation	Project
Towns With Heart Inc	Kurri Kurri Nostalgia Festival 2024
NSW Rural Fire Service - Hunter Valley Support Brigade	Bulk Water Tanker Rebuild
University of Newcastle	Science & Engineering Challenge (Year 2 of 3 year agreement)
University of Newcastle	SMART Science School Tour (Year 2 of 3 year agreement)

Advertising for the 2025 Community Support Program occurred over August-September 2024 with applications closing 27 September 2024. A report on the 2025 CSP will be provided in the next reporting period.

For information on the Yancoal Community Support Program please visit our website at https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mgt-docs or email mtw.csp@yancoal.com.au.

9 INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit was completed during the 2023 reporting period. An update of progress against the Action Plan developed in response to the 2023 Independent Environmental Audit is included in **Appendix 9**. The next MTW Independent Environmental Audit is due in 2026.

The environmental audit report and MTW's response to recommendations are available in full on the company website (https://www.yancoal.com.au/our-sites/mount-thorley-documents/#mgt-docs).

10 INCIDENTS AND NON-COMPLIANCE

A summary of the environmental incidents reported during 2024 are provided in **Table 10.1**.

TABLE 10.1 ENVIRONMENTAL INCIDENT SUMMARY 2024

Date	Incident Details	Follow up Actions
1/02/2024	An exceedance of the WML Noise Impact Assessment criteria was recorded at the Inlet Road monitoring location on 1 of February 2024 starting at 21:50. A mining continuum from WML was audible throughout the measurement, generating a site only LAeq of 36dB. A low-frequency modifying factor of +2dB was applicable to the Wambo Road measurement, in accordance with the NPfI, resulting in an adjusted site-only LAeq of 38 dB, which exceeded the relevant criterion by 1 dB.	In accordance with the approved NMP process, at 2/2/2024 00:40 (after the conclusion of the entire noise monitoring survey), the noise consultant advised MTW of the potential noise exceedance at the Inlet Road location. There were no other exceedances of noise criteria identified. MTW had already been undertaking supplementary noise readings and had attended the Inlet Road monitoring location at 1/2/2024 21:50 and had implemented operational controls prior to attending the Inlet Road area for a second supplementary noise monitoring event at 1/2/2024 22:40, which was 4 dB below the relevant criterion. No further operational changes were therefore necessary in response to the second supplementary noise monitoring at the Inlet Road location. MTW notified private residences within the Inlet Road representative monitoring area of the exceedance. The Department of Planning, Housing and Infrastructure (DPHI) was notified in writing of the exceedance measurement on 2 February 2024. A written report was provided to DPHI on 8 February 2024. DPHI completed an assessment and issued a Warning Letter in relation to a noise exceedance event on 5 July 2024, which also referred to the exceedances reported to DPHI for 1 February 2024 (1dB) and 22 April 2024 (1dB).
22/04/2024	An exceedance of the WML Noise Impact Assessment criteria was recorded at the Inlet Road monitoring location on 22 April 2024 starting at 21:28. A mining continuum from WML was audible throughout the measurement, generating a site only LAeq of 36dB. A low-frequency modifying factor of +2dB was applicable to the Wambo Road measurement, in accordance with the NPfI, resulting in an adjusted site-only	In accordance with the approved NMP process, at 23/4/2024 00:31 (after the conclusion of the entire noise monitoring survey), the noise consultant advised MTW of the potential noise exceedance at the Inlet Road location. There were no other exceedances of noise criteria identified by the noise consultant. MTW had already been undertaking supplementary noise readings since 22/4/2024 19:00 and had attended the Wambo Road monitoring location at 22/4/2024 20:45 in response to a Red Alarm

Date	Incident Details	Follow up Actions
	LAeq of 38 dB, which exceeded the relevant criterion by 1 dB.	triggered at 22/4/2024 20:35 from the Wambo Road Environmental Noise Compass. Supplementary handheld noise readings confirmed the validity of the alarm and a series of operational controls were implemented to reduce noise in response, between 20:45 and 21:35. Subsequent supplementary handheld noise readings at the Wambo Road location confirmed noise levels were within the noise criterion at this location by 21:00 and were 2dB below the noise criterion by 21:35. After the operational controls were implemented in response to noise management at the Wambo Road location, all supplementary handheld noise readings taken between 22/4/2024 21:00 and 23/4/2024 03:10 were within the relevant noise criteria at all locations. No further operational changes were therefore necessary in response to supplementary noise monitoring at any location. MTW notified private residences within the Inlet Road representative monitoring area of the exceedance. The Department of Planning, Housing and Infrastructure (DPHI) was notified in writing of the exceedance measurement on 23 April 2024. A written report was provided to DPHI on 1 May 2024. DPHI completed an assessment and issued a Warning Letter in relation to a noise exceedance event on 5 July 2024, which also referred to the exceedances reported to DPHI for 1 February 2024 (1dB) and 22 April 2024 (1dB).
7/05/2024	An exceedance of the WML Noise Impact Assessment criteria was recorded at the Inlet Road monitoring location on 7 May 2024 starting at 21:25. A mining continuum from WML was audible throughout the measurement, generating a site only LAeq of 37dB. A low-frequency modifying factor of +2dB was applicable to the Wambo Road measurement, in accordance with the NPfI, resulting in an adjusted site-only LAeq of 39 dB, which exceeded the relevant criterion by 2 dB.	In accordance with the approved NMP process, at 8/5/2024 00:37 (after the conclusion of the entire noise monitoring survey), the noise consultant advised MTW of the potential noise exceedance at the Inlet Road location. There were no other exceedances of noise criteria identified by the noise consultant. MTW commenced routine supplementary noise readings from 7/5/2024 18:30. The Inlet Road monitoring location was attended at 7/5/2024 19:55 which recorded a supplementary handheld noise reading 2dB below the noise criterion at this location.

Date	Incident Details	Follow up Actions
		The supplementary handheld noise monitoring continued during the shift on a routine basis during the night shift. The Inlet Road West monitoring location (which is further away from MTW's mining operations than The Inlet Road location), was attended at 7/5/2024 20:05. A supplementary handheld noise reading was recorded at 1 dB over the noise criterion at this location and a series of operational controls were implemented to reduce noise in response between 20:05 and 20:15, which reduced noise levels to the noise criterion by 20:30. Supplementary handheld noise readings at the Inlet Road West location at 20:55 identified noise levels were above the noise criterion at this location by 1dB, and further operational controls were implemented to reduce noise in response, which reduced noise levels to the noise criterion by 21:10. The Inlet Road monitoring location was attended at 7/5/2024 21:20. A supplementary handheld noise reading was recorded at 1 dB over the noise criterion at this location and further operational controls were implemented to reduce noise in response between 21:20 and 21:55, which reduced noise levels to the noise criterion by 22:10. After the operational controls were implemented in response to noise management at the Inlet Road location, all supplementary handheld noise readings taken between 7/5/2024 22:10 and 8/5/2024 04:00 were within the relevant noise criteria at all locations. No further operational changes were therefore necessary in response to supplementary noise monitoring at any location. MTW notified private residences within the Inlet Road representative monitoring area of the exceedance. The Department of Planning, Housing and Infrastructure (DPHI) was notified in writing of the exceedance measurement on 8 May 2024. A written report was provided to DPHI on 15 May 2024. DPHI completed an assessment and issued a Warning Letter in relation to this event on 5 July 2024, which also referred to the exceedances reported to

Date	Incident Details	Follow up Actions
		DPHI for 1 February 2024 (1dB) and 22 April 2024 (1dB).
20/06/2024	A WML North Pit blast (N45-GMB-PR4) which was fired at 11:42am on 20 June 2024 exceeded the 120dB(L) threshold for airblast overpressure, at the Abbey Green (120.55dB) and MTIE (122.67dB) monitoring locations.	An external investigation was undertaken to determine the contribution of relevant factors affecting airblast overpressure to the air pressure level recorded at the Putty Rd MTIE and Abbey Green monitoring locations. The investigation concluded that the primary cause of this event was "directional wavefront reinforcement due to the effect of the front row delay sequence used" and to prevent recurrence, additional blast planning and design controls will be implemented for future blasts. A preliminary notification of the exceedance was provided to the Department of Planning, Housing and Infrastructure and the EPA on 20 June 2024 and a written report was subsequently provided on 27 June 2024. An Official Caution was issued by the EPA in relation to this matter on 15 July 2024. The DPHI issued a Show Cause letter in relation to this event on 22 July 2024 and a response was provided on 9 August 2024. The DPHI completed an investigation and issued a Warning Letter in relation to this event on 16 August 2024. MTW notified affected landowners in writing of this exceedance.

11 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

MTW will endeavour to carry out the following activities during the 2025 reporting period at Mount Thorley Warkworth, as outlined in **Table 11.1**.

TABLE 11.1 PROPOSED ACTIVITIES FOR 2025 REPORTING PERIOD

ID	Performance Area	Activities Proposed
1	Noise	• Maintain and continue sound power level testing of attenuated fleet. • Continue undertaking noise management and monitoring actions in accordance with the MTW Noise Management Plan, including use of the new noise monitoring instrument and post processing tool to identify low frequency modifying factor with supplementary noise readings by MTW personnel. • Undertake quarterly comparison of real time and external noise monitoring to validate real time monitoring results. • Undertake quarterly comparison of real time and external noise monitoring to validate real time monitoring results.
2	Blasting	• Update MTW Blast Management Plan and submit for DPHI approval. • Testing and verification of a real time model, which will use real time meteorological data from weather stations throughout the Hunter Valley to better determine the effect of possible overpressure enhancement (real time model in development).
3	Air Quality	• Update MTW Air Quality Management Plan and submit for DPHI approval. • Upgrade of MTW DustTrak units. • Upgrade of Charlton Ridge meteorological station. • Relocate North Warkworth meteorological station to a more suitable and representative location. • Continue undertaking air quality management and monitoring actions in accordance with the MTW Air Quality Management Plan.

ID	Performance Area	Activities Proposed
4	Aboriginal Cultural Heritage	• Ongoing Aboriginal Cultural Heritage management in accordance with the AHMP plans. • Implementation of actions identified by the 2024 AHMP Compliance Inspection. • Inspection of the MTW-70 site (scarred tree) by CHWG representatives to verify cultural significance. • Progression of registration of the respective Wollombi Brook and Loders Creek Aboriginal Cultural Heritage Conservation Agreements on title during the period. • Cultural Heritage Working Group (CHWG) and Conservation Area Plan of Management Implementation Group (PMIG) meetings are planned to occur. Appointments to vacant PMIG positions (CHWG), review and progression of the Implementation Plans for the Conservation Areas.
5	Historic Heritage	• Ongoing Historic Heritage management in accordance with the HHMP. • Routine inspection and area maintenance works at Springwood Homestead, Red Brick House, and the RAAF Cook House. • Springwood Homestead access track upgrade and realignment, removal of trees around the building and supplementary stabilisation works (as needed), and scope development for subsequent preservation works. • RAAF Mess Hall track re-establishment and upgrade. Staged removal of asbestos containing materials, removal of hazardous tree-fall and surrounding vegetation, and initial structural stabilisation works. • Meetings of the Cultural Heritage Advisory Group (CHAG).
6	Water	• Improving the use of the site's water resources via completion of pumping infrastructure on the new water storage facility (North Out Of Pit dam (NOOP)). • Implementation of actions/recommendations from the annual groundwater review. • • Continue to monitor Rehabilitation runoff water quality. • Commissioning of Hunter River Salinity Trade Scheme infrastructure at MTO to achieve increased discharge rates as approved under the Mount Thorley Operations Consent (SSD-6465).

ID	Performance Area	Activities Proposed
7	Rehabilitation	• The rehabilitation monitoring programme will continue in 2025 for native vegetation rehabilitation areas. The monitoring program will be varied to align with changes to performance criteria in the Rehabilitation Management Plan as required. • Weed spraying (boom and spot spraying), cut and paint and weed wiping will be conducted in establishing rehabilitation areas as required to control both noxious and environmental weeds that are likely to impact on successful rehabilitation being achieved. It is planned that 89ha of new rehabilitation will be undertaken at MTW during 2025. • Habitat augmentation measures, such as the construction of habitat ponds and the placement of salvaged logs in rehabilitation areas. • Surface water will be managed on Tailings Dam 2 with the aim to increase the strength of the tailings surface. Capping activities will continue on areas of the Tailings Dam 2 surface that allow for the safe placement of material, following ongoing geotechnical investigations. • The feasibility and cost of dredging the Mini Strip Tailings Storage Facility will be investigated in 2025. The dredged tailings material is planned to be deposited in the larger Loders Pit TSF to reduce the amount of capping material required to cap this facility. Dredging of the tailings material from the Mini Strip TSF will also allow earlier bulk dumping of spoil to occur in the footprint of the facility. • Access tracks in rehabilitation areas will be upgraded to provide better access for maintenance and monitoring activities. • Conduct an analysis of the final landform stability using a landform evolution model. • Review seed mixes used to ensure that appropriate species and rates are being applied to new rehabilitation areas.

ID	Performance Area	Activities Proposed
8	Biodiversity Management	• Planting works will continue to restore Warkworth Sands Woodland in the Northern and Southern BA's. Planting works will also continue to restore Yellow Box – Grey Box – Red Gum grassy woodland and River Oak riparian woodland at the Goulburn River BA and Cassinia/Acacia regenerating shrubland/woodland at the Seven Oaks BA. • Conservation management actions will be undertaken across the BAs in 2025 in accordance with the Offset Management Plans, these will include; weed management, vertebrate pest management including 1080 ground baiting programmes to target wild dogs and foxes scheduled for autumn and spring and a Noisy miner control program in the Regent honeyeater breeding area at the Goulburn River BA, thermal ground shooting programmes at Bowditch, Seven Oaks and Goulburn River, rapid condition assessments, overall fuel load assessments and property inspections will be undertaken across all BAs. • The hazard reduction burn planned for North Rothbury BA will be undertaken if conditions are within the parameters of the approved burn plan. • Infrastructure improvement including fence repairs and replacement, track maintenance and river crossing installations will be undertaken as required. • During 2024, BCS completed an equivalence assessment associated with MTW's biodiversity offset land. With this step completed and in consultation with BCS, a BSA is intended to progress during 2025 for one offset area to develop the method for securing the BSA. After the individual offset BSA is completed and those credits retired, BSAs for each offset area will be progressed. The equivalent credit values established for each BSA will then be retired upon execution of the BSAs.
9	Community Engagement	• Continued operation of the Community Consultation Committee. • Implementation of the MTW Social Impact Management Plan (which outlines specific and general stakeholder engagement and consultation requirements).
10	Community Development	• Implementation of the Yancoal Community Support Program (CSP) during 2025. The CSP program provides an opportunity for multiple site or group-wide investment in larger, long-term, capacity building projects that make a positive difference. Focus areas include health, social and community, environment, education and training. • Continued funding and participation as a committee representative for the MTW Voluntary Planning Agreement to progress sustainable community projects in the local area.

Appendix 1:

Compliance Noise Monitoring Data



Compliance Noise Monitoring Data

Yancoal Mt Thorley Warkworth

2024

1.0 Noise

Routine attended noise monitoring is carried out in accordance with the MTW Noise Management Plan. The purpose of the noise surveys is to quantify and describe the acoustic environment around the site and compare results with specified limits. Attended noise monitoring locations are displayed in **Figure 1**.

1.1 Attended Noise Monitoring Results

Monthly attended monitoring was conducted at receiver locations surrounding MTW in 2024. There were three noise measurements taken during the reporting period which exceeded consent conditions following application of NPfI low frequency modifying factor. Results are detailed in **Table 1** to **Table 4.**

1.1.1 WML Noise Assessment

Compliance assessments undertaken against the WML noise criteria are presented in **Tables 1** and **2**.

Table 1: $L_{Aeq,\ 15\ minute}$ Warkworth Impact Assessment Criteria – 2024

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML L_{Aeq} dB[2,3,4,6]	Exceedance[3,4,6]
Bulga RFS	18/01/2024 23:22	1.9	F	37	Yes	IA	Nil
Bulga Village	18/01/2024 22:08	1.4	F	38	Yes	IA	Nil
Gouldsville	18/01/2024 21:20	1.9	F	38	Yes	<25	Nil
Inlet Rd	18/01/2024 21:25	1.8	F	37	Yes	IA	Nil
Inlet Rd West	18/01/2024 21:05	1.8	E	35	Yes	IA	Nil
Long Point	18/01/2024 21:00	1.8	E	35	Yes	IA	Nil
South Bulga	18/01/2024 23:03	1.7	F	35	Yes	IA	Nil
Wambo Road	18/01/2024 21:47	1.5	F	38	Yes	20	Nil
Bulga RFS	1/02/2024 23:25	0.2	E	37	Yes	30	Nil
Bulga Village	1/02/2024 22:43	1.4	E	38	Yes	33	Nil
Gouldsville	1/02/2024 21:21	0.3	F	38	Yes	<25	Nil
Inlet Road	1/02/2024 21:50	1.6	E	37	Yes	**38**	**Yes**
Inlet Road [5]	7/02/2024 21:07	2.1	E	37	Yes	IA	Nil
Inlet Road [5]	8/02/2024 22:45	2.0	E	37	Yes	IA	Nil
Inlet Road West	1/02/2024 21:21	0.3	F	35	Yes	35	Nil
Long Point	1/02/2024 21:00	0.8	F	35	Yes	IA	Nil
South Bulga	2/02/2024 0:21	0.3	D	35	Yes	IA	Nil
Wambo Road	1/02/2024 22:19	1.7	E	38	Yes	33	Nil
Bulga RFS	13/03/2024 22:52	2.2	F	37	Yes	<30	N/A
Bulga Village	13/03/2024 22:10	2.5	D	38	Yes	33	Nil
Gouldsville	13/03/2024 21:27	2.7	E	38	Yes	<30	Nil
Inlet Rd	13/03/2024 21:22	2.7	E	37	Yes	34	Nil
Inlet Rd West	13/03/2024 21:00	2.5	E	35	Yes	31	Nil
Long Point	13/03/2024 21:05	2.5	E	35	Yes	IA	Nil
South Bulga	13/03/2024 23:38	2.4	D	35	Yes	<25	Nil
Wambo Road	13/03/2024 21:48	2.5	D	38	Yes	34	Nil

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML L_{Aeq} dB[2,3,4,6]	Exceedance[3,4,6]
Bulga RFS	22/04/2024 23:11	2.6	E	37	Yes	30	Nil
Bulga Village	22/04/2024 22:30	2	D	38	Yes	<25	Nil
Gouldsville	22/04/2024 21:25	2.2	E	38	Yes	33	Nil
Inlet Road	22/04/2024 21:28	2.2	E	37	Yes	**38**	**1**
Inlet Road[5]	29/04/2024 22:00	2.5	E	37	Yes	35	Nil
Inlet Road West	22/04/2024 21:01	0.2	F	35	Yes	35	Nil
Long Point	22/04/2024 21:00	0.2	F	35	Yes	IA	Nil
South Bulga	22/04/2024 23:52	2.7	D	35	Yes	<30	Nil
Wambo Road	22/04/2024 22:05	1.9	D	38	Yes	38	Nil
Bulga RFS	7/05/2024 23:03	1.2	F	37	Yes	IA	Nil
Bulga Village	7/05/2024 22:18	1.9	F	38	Yes	26	Nil
Gouldsville	7/05/2024 22:21	1.9	F	38	Yes	32	Nil
Inlet Road	7/05/2024 21:25	2.5	D	37	Yes	**39**	**1**
Inlet Road[5]	13/05/2024 22:00	0.1	E	37	Yes	33	Nil
Inlet Road West	7/05/2024 21:00	2.3	E	35	Yes	34	Nil
Long Point	7/05/2024 21:48	2.4	D	35	Yes	NM	Nil
South Bulga	7/05/2024 23:52	1.9	D	35	Yes	IA	Nil
Wambo Road	7/05/2024 21:55	2.0	E	38	Yes	36	Nil
Bulga RFS	4/06/2024 22:48	0.3	F	37	Yes	33	Nil
Bulga Village	4/06/2024 22:07	2.2	F	38	No	<25	N/A
Gouldsville	4/06/2024 21:26	1.8	E	38	Yes	33	Nil
Inlet Road	4/06/2024 21:21	1.6	F	37	Yes	28	Nil
Inlet Road West	4/06/2024 21:00	2.8	D	35	Yes	<20	Nil
Long Point	4/06/2024 21:00	2.8	D	35	Yes	<20	Nil
South Bulga	4/06/2024 23:36	1.8	E	35	Yes	IA	Nil
Wambo Road	4/06/2024 21:46	2.5	D	38	Yes	IA	Nil
Bulga RFS	9/07/2024 23:13	2.0	E	37	Yes	IA	Nil
Bulga Village	9/07/2024 22:24	1.3	F	38	Yes	<20	Nil
Gouldsville	9/07/2024 21:24	1.3	F	38	Yes	42	Nil
Inlet Road	9/07/2024 21:29	1.3	F	37	Yes	IA	Nil
Inlet Road West	9/07/2024 21:00	2.2	F	35	No	IA	Nil
Long Point	9/07/2024 21:00	2.2	F	35	No	<20	Nil
South Bulga	10/07/2024 0:11	3.2	D	35	Yes	IA	Nil
Wambo Road	9/07/2024 21:57	1.8	E	38	Yes	<25	Nil
Bulga RFS	6/08/2024 22:57	1.9	E	37	Yes	<30	Nil
Bulga Village	6/08/2024 22:13	1.4	E	38	Yes	33	Nil
Gouldsville	6/08/2024 21:20	0.1	F	38	Yes	IA	Nil
Inlet Road	6/08/2024 21:24	0.1	E	37	Yes	36	Nil
Inlet Road West	6/08/2024 21:00	1.0	D	35	Yes	30	Nil
Long Point	6/08/2024 21:00	1.0	D	35	Yes	IA	Nil
South Bulga	6/08/2024 23:40	2.2	E	35	Yes	IA	Nil

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML L_{Aeq} dB[2,3,4,6]	Exceedance[3,4,6]
Wambo Road	6/08/2024 21:48	0.1	E	38	Yes	33	Nil
Bulga RFS	2/09/2024 23:15	3.0	D	37	Yes	IA	Nil
Bulga Village	2/09/2024 22:29	3.7	D	38	No	<25	NA
Gouldsville	2/09/2024 21:00	3.5	D	38	No	24	NA
Inlet Road	2/09/2024 21:35	3.6	D	37	No	IA	NA
Inlet Road West	2/09/2024 21:12	3.0	D	35	Yes	IA	Nil
Long Point	2/09/2024 21:22	3.6	D	35	No	27	NA
South Bulga	3/09/2024 0:08	2.1	F	35	No	IA	NA
Wambo Road	2/09/2024 22:02	4.1	D	38	No	<25	NA
Bulga RFS	8/10/2024 23:02	4.0	D	37	No	IA	NA
Bulga Village	8/10/2024 22:15	4.0	D	38	No	IA	NA
Gouldsville	8/10/2024 21:23	3.6	D	38	No	<30	NA
Inlet Road	8/10/2024 21:25	3.6	D	37	No	IA	NA
Inlet Road West	8/10/2024 21:00	3.6	D	35	No	IA	NA
Long Point	8/10/2024 21:00	3.6	D	35	No	IA	NA
South Bulga	8/10/2024 23:22	3.1	D	35	No	IA	NA
Wambo Road	8/10/2024 21:52	4.0	D	38	No	IA	NA
Bulga RFS	14/11/2024 23:32	2.5	F	37	No	IA	NA
Bulga Village	14/11/2024 22:08	3.1	D	38	No	<25	NA
Gouldsville	14/11/2024 21:34	3.2	E	38	No	<25	NA
Inlet Road	14/11/2024 21:23	3.2	E	37	No	NM	NA
Inlet Road West	14/11/2024 21:00	3.3	D	35	No	IA	NA
Long Point	14/11/2024 21:10	3.5	E	35	No	IA	NA
South Bulga	14/11/2024 23:10	2.0	F	35	Yes	IA	Nil
Wambo Road	14/11/2024 21:50	2.9	E	38	Yes	<20	Nil
Bulga RFS	12/12/2024 23:39	1.8	E	37	Yes	<30	Nil
Bulga Village	12/12/2024 22:12	2.9	D	38	Yes	34	Nil
Gouldsville	12/12/2024 21:25	2.5	D	38	Yes	IA	Nil
Inlet Road	12/12/2024 21:34	2.9	D	37	Yes	34	Nil
Inlet Road West	12/12/2024 21:00	2.5	D	35	Yes	33	Nil
Long Point	12/12/2024 21:00	2.9	D	35	Yes	IA	Nil
South Bulga	13/12/2024 0:36	2.4	D	35	Yes	IA	Nil
Wambo Road	12/12/2024 22:42	2.4	D	38	Yes	34	Nil

Notes:

1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;

2. Site-only LAeq,15minute attributed to WML, including modifying factors if applicable;

3. IA denotes 'Inaudible'.

4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable;

5. Follow up measurement within two weeks of measured exceedance.

6. Bold results in red indicate exceedance of relevant criterion;

Table 2: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – 2024

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML $L_{A1,\ 1min}$ dB[2,3,4,6]	Exceedance[3,4,6]
Bulga RFS	18/01/2024 23:22	1.9	F	47	Yes	IA	Nil
Bulga Village	18/01/2024 22:08	1.4	F	48	Yes	IA	Nil
Gouldsville	18/01/2024 21:20	1.9	F	48	Yes	<25	Nil
Inlet Rd	18/01/2024 21:25	1.8	F	47	Yes	IA	Nil
Inlet Rd West	18/01/2024 21:05	1.8	E	45	Yes	IA	Nil
Long Point	18/01/2024 21:00	1.8	E	45	Yes	IA	Nil
South Bulga	18/01/2024 23:03	1.7	F	45	Yes	IA	Nil
Wambo Road	18/01/2024 21:47	1.5	F	48	Yes	20	Nil
Bulga RFS	1/02/2024 23:25	0.2	E	47	Yes	32	Nil
Bulga Village	1/02/2024 22:43	1.4	E	48	Yes	37	Nil
Gouldsville	1/02/2024 21:21	0.3	F	48	Yes	<25	Nil
Inlet Road	1/02/2024 21:50	1.6	E	47	Yes	44	Nil
Inlet Road [5]	7/02/2024 21:07	2.1	E	47	Yes	IA	Nil
Inlet Road [5]	8/02/2024 22:45	2.0	E	47	Yes	IA	Nil
Inlet Road West	1/02/2024 21:21	0.3	F	45	Yes	39	Nil
Long Point	1/02/2024 21:00	0.8	F	45	Yes	IA	Nil
South Bulga	2/02/2024 0:21	0.3	D	45	Yes	IA	Nil
Wambo Road	1/02/2024 22:19	1.7	E	48	Yes	35	Nil
Bulga RFS	13/03/2024 22:52	2.2	F	47	Yes	<30	N/A
Bulga Village	13/03/2024 22:10	2.5	D	48	Yes	36	Nil
Gouldsville	13/03/2024 21:27	2.7	E	48	Yes	<30	Nil
Inlet Rd	13/03/2024 21:22	2.7	E	47	Yes	38	Nil
Inlet Rd West	13/03/2024 21:00	2.5	E	45	Yes	35	Nil
Long Point	13/03/2024 21:05	2.5	E	45	Yes	IA	Nil
South Bulga	13/03/2024 23:38	2.4	D	45	Yes	<25	Nil
Wambo Road	13/03/2024 21:48	2.5	D	48	Yes	36	Nil
Bulga RFS	22/04/2024 23:11	2.6	E	47	Yes	40	Nil
Bulga Village	22/04/2024 22:30	2.0	D	48	Yes	<25	Nil
Gouldsville	22/04/2024 21:25	2.2	E	48	Yes	38	Nil
Inlet Road	22/04/2024 21:28	2.2	E	47	Yes	43	Nil
Inlet Road [5]	29/04/2024 22:00	2.5	E	47	Yes	38	Nil
Inlet Road West	22/04/2024 21:01	0.2	F	45	Yes	40	Nil
Long Point	22/04/2024 21:00	0.2	F	45	Yes	IA	Nil
South Bulga	22/04/2024 23:52	2.7	D	45	Yes	33	Nil
Wambo Road	22/04/2024 22:05	1.9	D	48	Yes	40	Nil
Bulga RFS	7/05/2024 23:03	1.2	F	47	Yes	IA	Nil

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML $L_{A1, 1min}$ dB[2,3,4,6]	Exceedance[3,4,6]
Bulga Village	7/05/2024 22:18	1.9	F	48	Yes	30	Nil
Gouldsville	7/05/2024 22:21	1.9	F	48	Yes	35	Nil
Inlet Road	7/05/2024 21:25	2.5	D	47	Yes	40	Nil
Inlet Road[5]	13/05/2024 22:00	0.1	E	47	Yes	38	Nil
Inlet Road West	7/05/2024 21:00	2.3	E	45	Yes	40	Nil
Long Point	7/05/2024 21:48	2.4	D	45	Yes	NM	Nil
South Bulga	7/05/2024 23:52	1.9	D	45	Yes	IA	Nil
Wambo Road	7/05/2024 21:55	2.0	E	48	Yes	38	Nil
Bulga RFS	4/06/2024 22:48	0.3	F	47	Yes	38	Nil
Bulga Village	4/06/2024 22:07	2.2	F	48	No	<25	N/A
Gouldsville	4/06/2024 21:26	1.8	E	48	Yes	45	Nil
Inlet Road	4/06/2024 21:21	1.6	F	47	Yes	32	Nil
Inlet Road West	4/06/2024 21:00	2.8	D	45	Yes	<20	Nil
Long Point	4/06/2024 21:00	2.8	D	45	Yes	<20	Nil
South Bulga	4/06/2024 23:36	1.8	E	45	Yes	IA	Nil
Wambo Road	4/06/2024 21:46	2.5	D	48	Yes	IA	Nil
Bulga RFS	9/07/2024 23:13	2.0	E	47	Yes	IA	Nil
Bulga Village	9/07/2024 22:24	1.3	F	48	Yes	IA	Nil
Gouldsville	9/07/2024 21:24	1.3	F	48	Yes	<30	Nil
Inlet Road	9/07/2024 21:29	1.3	F	47	Yes	IA	Nil
Inlet Road West	9/07/2024 21:00	2.2	F	45	No	IA	Nil
Long Point	9/07/2024 21:00	2.2	F	45	No	<20	Nil
South Bulga	10/07/2024 0:11	3.2	D	45	No	<25	Nil
Wambo Road	9/07/2024 21:57	1.8	E	48	Yes	IA	Nil
Bulga RFS	6/08/2024 22:57	1.9	E	47	Yes	35	Nil
Bulga Village	6/08/2024 22:13	1.4	E	48	Yes	<30	Nil
Gouldsville	6/08/2024 21:20	0.1	F	48	Yes	<25	Nil
Inlet Road	6/08/2024 21:24	0.1	E	47	Yes	IA	Nil
Inlet Road West	6/08/2024 21:00	1.0	D	45	Yes	33	Nil
Long Point	6/08/2024 21:00	1.0	D	45	Yes	<30	Nil
South Bulga	6/08/2024 23:40	2.2	E	45	Yes	35	Nil
Wambo Road	6/08/2024 21:48	0.1	E	48	Yes	35	Nil
Bulga RFS	2/09/2024 23:15	3.0	D	47	Yes	<20	Nil
Bulga Village	2/09/2024 22:29	3.7	D	48	No	IA	NA
Gouldsville	2/09/2024 21:00	3.5	D	48	No	IA	NA
Inlet Road	2/09/2024 21:35	3.6	D	47	No	IA	NA
Inlet Road West	2/09/2024 21:12	3.0	D	45	Yes	IA	Nil

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML $L_{A1, 1min}$ dB[2,3,4,6]	Exceedance[3,4,6]
Long Point	2/09/2024 21:22	3.6	D	45	No	IA	NA
South Bulga	3/09/2024 0:08	2.1	F	45	No	iA	NA
Wambo Road	2/09/2024 22:02	4.1	D	48	No	IA	NA
Bulga RFS	8/10/2024 23:02	4.0	D	47	No	IA	NA
Bulga Village	8/10/2024 22:15	4.0	D	48	No	IA	NA
Gouldsville	8/10/2024 21:23	3.6	D	48	No	40	NA
Inlet Road	8/10/2024 21:25	3.6	D	47	No	IA	NA
Inlet Road West	8/10/2024 21:00	3.6	D	45	No	IA	NA
Long Point	8/10/2024 21:00	3.6	D	45	No	IA	NA
South Bulga	8/10/2024 23:22	3.1	D	45	No	IA	NA
Wambo Road	8/10/2024 21:52	4.0	D	48	No	IA	NA
Bulga RFS	14/11/2024 23:32	2.5	F	47	No	IA	NA
Bulga Village	14/11/2024 22:08	3.1	D	48	No	<25	NA
Gouldsville	14/11/2024 21:34	3.2	E	48	No	<25	NA
Inlet Road	14/11/2024 21:23	3.2	E	47	No	NM	NA
Inlet Road West	14/11/2024 21:00	3.3	D	45	No	IA	NA
Long Point	14/11/2024 21:10	3.5	E	45	No	IA	NA
South Bulga	14/11/2024 23:10	2.0	F	45	Yes	IA	Nil
Wambo Road	14/11/2024 21:50	2.9	E	48	Yes	26	Nil
Bulga RFS	12/12/2024 23:39	1.8	E	47	Yes	<35	Nil
Bulga Village	12/12/2024 22:12	2.9	D	48	Yes	38	Nil
Gouldsville	12/12/2024 21:25	2.5	D	48	Yes	IA	Nil
Inlet Road	12/12/2024 21:34	2.9	D	47	Yes	38	Nil
Inlet Road West	12/12/2024 21:00	2.5	D	45	Yes	36	Nil
Long Point	12/12/2024 21:00	2.9	D	45	Yes	IA	Nil
South Bulga	13/12/2024 0:36	2.4	D	45	Yes	IA	Nil
Wambo Road	12/12/2024 22:42	2.4	D	48	Yes	40	Nil

Notes:

1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;

2. Site-only LAeq,1 minute attributed to WML, including modifying factors if applicable;

3. IA denotes 'Inaudible'.

4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable;

5. Follow up measurement within two weeks of measured exceedance.

6. Bold results in red indicate exceedance of relevant criterion;

1.1.2 MTO Noise Assessment

Compliance assessments undertaken against the MTO noise criteria are presented in **Table 3** and **Table 4**.

Table 3: $L_{Aeq, 15minute}$ Mount Thorley - Impact Assessment Criteria – 2024

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3,4,6]	Exceedance[3,4,6]
Bulga RFS	18/01/2024 23:22	1.9	F	37	Yes	IA	Nil
Bulga Village	18/01/2024 22:08	1.4	F	38	Yes	IA	Nil
Gouldsville	18/01/2024 21:20	1.9	F	35	Yes	IA	Nil
Inlet Rd	18/01/2024 21:25	1.8	F	37	Yes	IA	Nil
Inlet Rd West	18/01/2024 21:05	1.8	E	35	Yes	IA	Nil
Long Point	18/01/2024 21:00	1.8	E	35	Yes	IA	Nil
South Bulga	18/01/2024 23:03	1.7	F	36	Yes	IA	Nil
Wambo Road	18/01/2024 21:47	1.5	F	38	Yes	IA	Nil
Bulga RFS	1/02/2024 23:25	0.2	E	37	Yes	35	Nil
Bulga Village	1/02/2024 22:43	1.4	E	38	Yes	<30	Nil
Gouldsville	1/02/2024 21:21	0.3	F	35	Yes	IA	Nil
Inlet Road	1/02/2024 21:50	1.6	E	37	Yes	<30	Nil
Inlet Road [5]	7/02/2024 21:07	2.1	E	37	Yes	IA	Nil
Inlet Road [5]	8/02/2024 22:45	2.0	E	37	Yes	IA	Nil
Inlet Road West	1/02/2024 21:21	0.3	F	35	Yes	IA	Nil
Long Point	1/02/2024 21:00	0.8	F	35	Yes	IA	Nil
South Bulga	2/02/2024 0:21	0.3	D	36	Yes	33	Nil
Wambo Road	1/02/2024 22:19	1.7	E	38	Yes	IA	Nil
Bulga RFS	13/03/2024 22:52	2.2	F	37	No	32	N/A
Bulga Village	13/03/2024 22:10	2.5	D	38	Yes	<30	Nil
Gouldsville	13/03/2024 21:27	2.7	E	35	Yes	IA	Nil
Inlet Road	13/03/2024 21:22	2.7	E	37	Yes	30	Nil
Inlet Road West	13/03/2024 21:00	2.5	E	35	Yes	28	Nil
Long Point	13/03/2024 21:05	2.5	E	35	Yes	IA	Nil
South Bulga	13/03/2024 23:38	2.4	D	36	Yes	<30	Nil
Wambo Road	13/03/2024 21:48	2.5	D	38	Yes	27	Nil
Bulga RFS	22/04/2024 23:11	2.6	E	37	Yes	IA	Nil
Bulga Village	22/04/2024 22:30	2.0	D	38	Yes	IA	Nil
Gouldsville	22/04/2024 21:25	2.2	E	35	Yes	IA	Nil
Inlet Road	22/04/2024 21:28	2.2	E	37	Yes	IA	Nil
Inlet Road [5]	29/04/2024 22:00	2.5	E	37	Yes	IA	Nil
Inlet Road West	22/04/2024 21:01	0.2	F	35	Yes	IA	Nil

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3,4,6]	Exceedance[3,4,6]
Long Point	22/04/2024 21:00	0.2	F	35	Yes	IA	Nil
South Bulga	22/04/2024 23:52	2.7	D	36	Yes	IA	Nil
Wambo Road	22/04/2024 22:05	1.9	D	38	Yes	IA	Nil
Bulga RFS	7/05/2024 23:03	1.2	F	37	Yes	<25	Nil
Bulga Village	7/05/2024 22:18	1.9	F	38	Yes	NM	Nil
Gouldsville	7/05/2024 22:21	1.9	F	35	Yes	IA	Nil
Inlet Road	7/05/2024 21:25	2.5	D	37	Yes	IA	Nil
Inlet Road [5]	13/05/2024 22:00	0.1	E	37	Yes	NM	Nil
Inlet Road West	7/05/2024 21:00	2.3	E	35	Yes	IA	Nil
Long Point	7/05/2024 21:48	2.4	D	35	Yes	IA	Nil
South Bulga	7/05/2024 23:52	1.9	D	36	Yes	31	Nil
Wambo Road	7/05/2024 21:55	2.0	E	38	Yes	IA	Nil
Bulga RFS	4/06/2024 22:48	0.3	F	37	Yes	31	Nil
Bulga Village	4/06/2024 22:07	2.2	F	38	No	<30	N/A
Gouldsville	4/06/2024 21:26	1.8	E	35	Yes	IA	Nil
Inlet Road	4/06/2024 21:21	1.6	F	37	Yes	IA	Nil
Inlet Road West	4/06/2024 21:00	2.8	D	35	Yes	IA	Nil
Long Point	4/06/2024 21:00	2.8	D	35	Yes	28	Nil
South Bulga	4/06/2024 23:36	1.8	E	36	Yes	<20	Nil
Wambo Road	4/06/2024 21:46	2.5	D	38	Yes	31	Nil
Bulga RFS	9/07/2024 23:13	2.0	E	37	Yes	IA	Nil
Bulga Village	9/07/2024 22:24	1.3	F	38	Yes	<20	Nil
Gouldsville	9/07/2024 21:24	1.3	E	35	Yes	33	Nil
Inlet Road	9/07/2024 21:29	1.3	F	37	Yes	IA	Nil
Inlet Road West	9/07/2024 21:00	2.2	F	35	No	IA	Nil
Long Point	9/07/2024 21:00	2.2	F	35	No	<20	Nil
South Bulga	10/07/2024 0:11	3.2	D	36	No	IA	Nil
Wambo Road	9/07/2024 21:57	1.8	E	38	Yes	<25	Nil
Bulga RFS	6/08/2024 22:57	1.9	E	37	Yes	35	Nil
Bulga Village	6/08/2024 22:13	1.4	E	38	Yes	<30	Nil
Gouldsville	6/08/2024 21:20	0.1	F	35	Yes	IA	Nil
Inlet Road	6/08/2024 21:24	0.1	E	37	Yes	<30	Nil
Inlet Road West	6/08/2024 21:00	1.0	D	35	Yes	<25	Nil
Long Point	6/08/2024 21:00	1.0	D	35	Yes	IA	Nil
South Bulga	6/08/2024 23:40	2.2	E	36	Yes	33	Nil
Wambo Road	6/08/2024 21:48	0.1	E	38	Yes	<30	Nil

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3,4,6]	Exceedance[3,4,6]
Bulga RFS	2/09/2024 23:15	3.0	D	37	Yes	IA	Nil
Bulga Village	2/09/2024 22:29	3.7	D	38	No	<25	NA
Gouldsville	2/09/2024 21:00	3.5	D	35	No	24	NA
Inlet Road	2/09/2024 21:35	3.6	D	37	No	IA	NA
Inlet Road West	2/09/2024 21:12	3.0	D	35	Yes	IA	Nil
Long Point	2/09/2024 21:22	3.6	D	35	No	27	NA
South Bulga	3/09/2024 0:08	2.1	F	36	No	IA	NA
Wambo Road	2/09/2024 22:02	4.1	D	38	No	<25	NA
Bulga RFS	8/10/2024 23:02	4.0	D	37	No	IA	NA
Bulga Village	8/10/2024 22:15	4.0	D	38	No	IA	NA
Gouldsville	8/10/2024 21:23	3.6	D	35	No	IA	NA
Inlet Road	8/10/2024 21:25	3.6	D	37	No	IA	NA
Inlet Road West	8/10/2024 21:00	3.6	D	35	No	IA	NA
Long Point	8/10/2024 21:00	3.6	D	35	No	IA	NA
South Bulga	8/10/2024 23:22	3.1	D	36	No	IA	NA
Wambo Road	8/10/2024 21:52	4.0	D	38	No	27	NA
Bulga RFS	14/11/2024 23:32	2.5	F	37	No	<20	NA
Bulga Village	14/11/2024 22:08	3.1	D	38	No	<20	NA
Gouldsville	14/11/2024 21:34	3.2	E	35	No	IA	NA
Inlet Road	14/11/2024 21:23	3.2	E	37	No	IA	NA
Inlet Road West	14/11/2024 21:00	3.3	D	35	No	IA	NA
Long Point	14/11/2024 21:10	3.5	E	35	No	IA	NA
South Bulga	14/11/2024 23:10	2.0	F	36	Yes	<20	Nil
Wambo Road	14/11/2024 21:50	2.9	E	38	Yes	IA	Nil
Bulga RFS	12/12/2024 23:39	1.8	E	37	Yes	32	Nil
Bulga Village	12/12/2024 22:12	2.9	D	38	Yes	<35	Nil
Gouldsville	12/12/2024 21:25	2.5	D	35	Yes	IA	Nil
Inlet Road	12/12/2024 21:34	2.9	D	37	Yes	<30	Nil
Inlet Road West	12/12/2024 21:00	2.5	D	35	Yes	<30	Nil
Long Point	12/12/2024 21:00	2.9	D	35	Yes	IA	Nil
South Bulga	13/12/2024 0:36	2.4	D	36	Yes	<35	Nil
Wambo Road	12/12/2024 22:42	2.4	D	38	Yes	<30	Nil

Notes:

1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;

2. Site-only LAeq,15 minute attributed to MTO, including modifying factors if applicable;

3. IA denotes 'Inaudible'.

4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable;

5. Follow up measurement within two weeks of measured exceedance.

6. Bold results in red indicate exceedance of relevant criterion;

Table 4: $L_{A1, 1Minute}$ Mount Thorley - Impact Assessment Criteria – 2024

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1, 1min}$ dB[2,3,4, 6]	Exceedance[3,4]
Bulga RFS	18/01/2024 23:22	1.9	F	47	Yes	IA	Nil
Bulga Village	18/01/2024 22:08	1.4	F	48	Yes	IA	Nil
Gouldsville	18/01/2024 21:20	1.9	F	45	Yes	IA	Nil
Inlet Rd	18/01/2024 21:25	1.8	F	47	Yes	IA	Nil
Inlet Rd West	18/01/2024 21:05	1.8	E	45	Yes	IA	Nil
Long Point	18/01/2024 21:00	1.8	E	45	Yes	IA	Nil
South Bulga	18/01/2024 23:03	1.7	F	46	Yes	IA	Nil
Wambo Road	18/01/2024 21:47	1.5	F	48	Yes	IA	Nil
Bulga RFS	1/02/2024 23:25	0.2	E	47	Yes	41	Nil
Bulga Village	1/02/2024 22:43	1.4	E	48	Yes	35	Nil
Gouldsville	1/02/2024 21:21	0.3	F	45	Yes	IA	Nil
Inlet Road	1/02/2024 21:50	1.6	E	47	Yes	<30	Nil
Inlet Road [5]	7/02/2024 21:07	2.1	E	47	Yes	IA	Nil
Inlet Road [5]	8/02/2024 22:45	2.0	E	47	Yes	IA	Nil
Inlet Road West	1/02/2024 21:21	0.3	F	45	Yes	IA	Nil
Long Point	1/02/2024 21:00	0.8	F	45	Yes	IA	Nil
South Bulga	2/02/2024 0:21	0.3	D	46	Yes	38	Nil
Wambo Road	1/02/2024 22:19	1.7	E	48	Yes	IA	Nil
Bulga RFS	13/03/2024 22:52	2.2	F	47	No	39	N/A
Bulga Village	13/03/2024 22:10	2.5	D	48	Yes	<30	Nil
Gouldsville	13/03/2024 21:27	2.7	E	45	Yes	IA	Nil
Inlet Road	13/03/2024 21:22	2.7	E	47	Yes	32	Nil
Inlet Road West	13/03/2024 21:00	2.5	E	45	Yes	30	Nil
Long Point	13/03/2024 21:05	2.5	E	45	Yes	IA	Nil
South Bulga	13/03/2024 23:38	2.4	D	46	Yes	<30	Nil
Wambo Road	13/03/2024 21:48	2.5	D	48	Yes	32	Nil
Bulga RFS	22/04/2024 23:11	2.6	E	47	Yes	IA	Nil
Bulga Village	22/04/2024 22:30	2.0	D	48	Yes	IA	Nil
Gouldsville	22/04/2024 21:25	2.2	E	45	Yes	IA	Nil
Inlet Road	22/04/2024 21:28	2.2	E	47	Yes	IA	Nil
Inlet Road [5]	29/04/2024 22:00	2.5	E	47	Yes	IA	Nil
Inlet Road West	22/04/2024 21:01	0.2	F	45	Yes	IA	Nil
Long Point	22/04/2024 21:00	0.2	F	45	Yes	IA	Nil
South Bulga	22/04/2024 23:52	2.7	D	46	Yes	IA	Nil
Wambo Road	22/04/2024 22:05	1.9	D	48	Yes	IA	Nil

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1, 1min}$ dB[2,3,4, 6]	Exceedance[3,4]
Bulga RFS	7/05/2024 23:03	1.2	F	47	Yes	<25	Nil
Bulga Village	7/05/2024 22:18	1.9	F	48	Yes	NM	Nil
Gouldsville	7/05/2024 22:21	1.9	F	45	Yes	IA	Nil
Inlet Road	7/05/2024 21:25	2.5	D	47	Yes	IA	Nil
Inlet Road [5]	13/05/2024 22:00	0.1	E	47	Yes	NM	Nil
Inlet Road West	7/05/2024 21:00	2.3	E	45	Yes	IA	Nil
Long Point	7/05/2024 21:48	2.4	D	45	Yes	IA	Nil
South Bulga	7/05/2024 23:52	1.9	D	46	Yes	38	Nil
Wambo Road	7/05/2024 21:55	2.0	E	48	Yes	IA	Nil
Bulga RFS	4/06/2024 22:48	0.3	F	47	Yes	35	Nil
Bulga Village	4/06/2024 22:07	2.2	F	48	No	<30	N/A
Gouldsville	4/06/2024 21:26	1.8	E	45	Yes	IA	Nil
Inlet Road	4/06/2024 21:21	1.6	F	47	Yes	IA	Nil
Inlet Road West	4/06/2024 21:00	2.8	D	45	Yes	IA	Nil
Long Point	4/06/2024 21:00	2.8	D	45	Yes	35	Nil
South Bulga	4/06/2024 23:36	1.8	E	46	Yes	<20	Nil
Wambo Road	4/06/2024 21:46	2.5	D	48	Yes	38	Nil
Bulga RFS	9/07/2024 23:13	2.0	E	47	Yes	IA	Nil
Bulga Village	9/07/2024 22:24	1.3	F	48	Yes	<20	Nil
Gouldsville	9/07/2024 21:24	1.3	F	45	Yes	42	Nil
Inlet Road	9/07/2024 21:29	1.3	F	47	Yes	IA	Nil
Inlet Road West	9/07/2024 21:00	2.2	F	45	No	IA	Nil
Long Point	9/07/2024 21:00	2.2	F	45	No	<20	Nil
South Bulga	10/07/2024 0:11	3.2	D	46	No	IA	Nil
Wambo Road	9/07/2024 21:57	1.8	E	48	Yes	<25	Nil
Bulga RFS	6/08/2024 22:57	1.9	E	47	Yes	38	Nil
Bulga Village	6/08/2024 22:13	1.4	E	48	Yes	<30	Nil
Gouldsville	6/08/2024 21:20	0.1	F	45	Yes	IA	Nil
Inlet Road	6/08/2024 21:24	0.1	E	47	Yes	<30	Nil
Inlet Road West	6/08/2024 21:00	1.0	D	45	Yes	<25	Nil
Long Point	6/08/2024 21:00	1.0	D	45	Yes	IA	Nil
South Bulga	6/08/2024 23:40	2.2	E	46	Yes	35	Nil
Wambo Road	6/08/2024 21:48	0.1	E	48	Yes	35	Nil
Bulga RFS	2/09/2024 23:15	3.0	D	47	Yes	<20	Nil
Bulga Village	2/09/2024 22:29	3.7	D	48	No	IA	Nil
Gouldsville	2/09/2024 21:00	3.5	D	45	No	IA	NA

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1, 1min}$ dB[2,3,4, 6]	Exceedance[3,4]
Inlet Road	2/09/2024 21:35	3.6	D	47	No	IA	NA
Inlet Road West	2/09/2024 21:12	3.0	D	45	Yes	IA	Nil
Long Point	2/09/2024 21:22	3.6	D	45	No	IA	NA
South Bulga	3/09/2024 0:08	2.1	F	46	No	IA	NA
Wambo Road	2/09/2024 22:02	4.1	D	48	No	IA	NA
Bulga RFS	8/10/2024 23:02	4.0	D	47	No	IA	NA
Bulga Village	8/10/2024 22:15	4.0	D	48	No	IA	NA
Gouldsville	8/10/2024 21:23	3.6	D	45	No	IA	NA
Inlet Road	8/10/2024 21:25	3.6	D	47	No	IA	NA
Inlet Road West	8/10/2024 21:00	3.6	D	45	No	IA	NA
Long Point	8/10/2024 21:00	3.6	D	45	No	IA	NA
South Bulga	8/10/2024 23:22	3.1	D	46	No	IA	NA
Wambo Road	8/10/2024 21:52	4.0	D	48	No	33	NA
Bulga RFS	14/11/2024 23:32	2.5	F	47	No	27	NA
Bulga Village	14/11/2024 22:08	3.1	D	48	No	<25	NA
Gouldsville	14/11/2024 21:34	3.2	E	45	No	IA	NA
Inlet Road	14/11/2024 21:23	3.2	E	47	No	IA	NA
Inlet Road West	14/11/2024 21:00	3.3	D	45	No	IA	NA
Long Point	14/11/2024 21:10	3.5	E	45	No	IA	NA
South Bulga	14/11/2024 23:10	2.0	F	46	Yes	<25	Nil
Wambo Road	14/11/2024 21:50	2.9	E	48	Yes	IA	Nil
Bulga RFS	12/12/2024 23:39	1.8	E	47	Yes	36	Nil
Bulga Village	12/12/2024 22:12	2.9	D	48	Yes	<35	Nil
Gouldsville	12/12/2024 21:25	2.5	D	45	Yes	IA	Nil
Inlet Road	12/12/2024 21:34	2.9	D	47	Yes	<30	Nil
Inlet Road West	12/12/2024 21:00	2.5	D	45	Yes	<30	Nil
Long Point	12/12/2024 21:00	2.9	D	45	Yes	IA	Nil
South Bulga	13/12/2024 0:36	2.4	D	46	Yes	35	Nil
Wambo Road	12/12/2024 22:42	2.4	D	48	Yes	<30	Nil

Notes

1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;

2. Site-only LAeq, 1 minute attributed to MTO, including modifying factors if applicable;

3. IA denotes 'Inaudible'.

4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable;

5. Follow up measurement within two weeks of measured exceedance.

6. Bold results in red indicate exceedance of relevant criterion;

1.1.3 Low Frequency Assessment

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfI), the applicability of the low frequency modification factor corrections has been assessed. There were six noise measurements taken during the reporting period which required the penalty to be applied. The WML assessment for low frequency noise is shown in **Table 5** and the MTO assessment for low frequency noise is shown in **Table 6.**

Table 5: Warkworth Low Frequency Noise Assessment – 2024

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?[2]	Frequency of Tonality[2,3]	Low-frequency Modifying Factor?[2]	Maximum Exceedance of Reference Spectrum [3,4,6]	Penalty dB[3,4]	Exceedance[3,4,6,7]
Bulga RFS	18/01/2024 23:22	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	18/01/2024 22:08	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	18/01/2024 21:20	<25	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	18/01/2024 21:25	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	18/01/2024 21:05	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	18/01/2024 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	18/01/2024 23:03	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	18/01/2024 21:47	20	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	1/02/2024 23:25	30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	1/02/2024 22:43	33	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	1/02/2024 21:21	<25	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road	1/02/2024 21:50	36	Yes	No	No	NA	Yes	**1 dB @ 80 Hz**	**2**	**Yes**
Inlet Road [5]	7/02/2024 21:07	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road [5]	8/02/2024 22:45	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road West	1/02/2024 21:21	35	Yes	No	No	NA	No	NA	Nil	NA
Long Point	1/02/2024 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?[2]	Frequency of Tonality[2,3]	Low-frequency Modifying Factor?[2]	Maximum Exceedance of Reference Spectrum [3,4,6]	Penalty dB[3,4]	Exceedance[3,4,6,7]
South Bulga	2/02/2024 0:21	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	1/02/2024 22:19	33	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	13/03/2024 22:52	<30	No	N/A	N/A	NA	N/A	NA	Nil	NA
Bulga Village	13/03/2024 22:10	33	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	13/03/2024 21:27	<30	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road	13/03/2024 21:22	34	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road West	13/03/2024 21:00	31	Yes	No	No	NA	No	NA	Nil	NA
Long Point	13/03/2024 21:05	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	13/03/2024 23:38	<25	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	13/03/2024 21:48	34	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	22/04/2024 23:11	30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	22/04/2024 22:30	<25	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	22/04/2024 21:25	33	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road	22/04/2024 21:28	36	Yes	No	No	NA	Yes	**3 dB at 80 Hz**	**2 dB**	**Yes**
Inlet Road[5]	29/04/2024 22:00	35	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road West	22/04/2024 21:01	33	Yes	No	No	NA	Yes	1 dB at 80 Hz	2 dB	NA
Long Point	22/04/2024 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	22/04/2024 23:52	<30	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	22/04/2024 22:05	36	Yes	No	No	NA	Yes	1 dB at 80 Hz	2 dB	NA
Bulga RFS	7/05/2024 23:03	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	7/05/2024 22:18	26	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	7/05/2024 22:21	32	Yes	No	No	NA	No	NA	Nil	NA

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?[2]	Frequency of Tonality[2,3]	Low-frequency Modifying Factor?[2]	Maximum Exceedance of Reference Spectrum [3,4,6]	Penalty dB[3,4]	Exceedance[3,4,6,7]
Inlet Road	7/05/2024 21:25	37	Yes	No	No	NA	Yes	2 dB at 80 Hz	2 dB	NA
Inlet Road [5]	13/05/2024 22:00	33	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road West	7/05/2024 21:00	34	Yes	No	No	NA	No	NA	2 dB	NA
Long Point	7/05/2024 21:48	NM	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	7/05/2024 23:52	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	7/05/2024 21:55	36	Yes	No	No	NA	No	NA	2 dB	NA
Bulga RFS	4/06/2024 22:48	33	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	4/06/2024 22:07	<25	No	N/A	N/A	NA	N/A	NA	N/A	Nil
Gouldsville	4/06/2024 21:26	33	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road	4/06/2024 21:21	28	Yes	No	No	NA	No	NA	Nil	Nil
Inlet Road West	4/06/2024 21:00	<20	Yes	No	No	NA	No	NA	Nil	NA
Long Point	4/06/2024 21:00	<20	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	4/06/2024 23:36	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	4/06/2024 21:46	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	9/07/2024 23:13	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	9/07/2024 22:24	<20	Yes	No	No	NA	N/A	NA	N/A	NA
Gouldsville	9/07/2024 21:24	33	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road	9/07/2024 21:29	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road West	9/07/2024 21:00	IA	No	No	No	NA	No	NA	Nil	NA
Long Point	9/07/2024 21:00	<20	No	No	No	NA	No	NA	Nil	NA
South Bulga	10/07/2024 0:11	IA	No	No	No	NA	No	NA	Nil	NA
Wambo Road	9/07/2024 21:57	<25	Yes	No	No	NA	No	NA	Nil	NA

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?[2]	Frequency of Tonality[2,3]	Low-frequency Modifying Factor?[2]	Maximum Exceedance of Reference Spectrum [3,4,6]	Penalty dB[3,4]	Exceedance[3,4,6,7]
Bulga RFS	6/08/2024 22:57	<30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	6/08/2024 22:13	33	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	6/08/2024 21:20	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road	6/08/2024 21:24	34	Yes	No	No	NA	Yes	1 dB @ 80Hz	2	NA
Inlet Road West	6/08/2024 21:00	30	No	No	No	NA	No	NA	Nil	NA
Long Point	6/08/2024 21:00	IA	No	No	No	NA	No	NA	Nil	NA
South Bulga	6/08/2024 23:40	IA	No	No	No	NA	No	NA	Nil	NA
Wambo Road	6/08/2024 21:48	33	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	2/09/2024 23:15	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	2/09/2024 22:29	<25	No	No	No	NA	NA	NA	Nil	NA
Gouldsville	2/09/2024 21:00	24	No	No	No	NA	NA	NA	Nil	NA
Inlet Road	2/09/2024 21:35	IA	No	No	No	NA	NA	NA	Nil	NA
Inlet Road West	2/09/2024 21:12	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	2/09/2024 21:22	27	No	No	No	NA	NA	NA	Nil	NA
South Bulga	3/09/2024 0:08	IA	No	No	No	NA	NA	NA	Nil	NA
Wambo Road	2/09/2024 22:02	<25	No	No	No	NA	NA	NA	Nil	NA
Bulga RFS	8/10/2024 23:02	IA	No	No	No	NA	NA	NA	Nil	NA
Bulga Village	8/10/2024 22:15	IA	No	No	No	NA	NA	NA	Nil	NA
Gouldsville	8/10/2024 21:23	<30	No	No	No	NA	NA	NA	Nil	NA
Inlet Road	8/10/2024 21:25	IA	No	No	No	NA	NA	NA	Nil	NA
Inlet Road West	8/10/2024 21:00	IA	No	No	No	NA	NA	NA	Nil	NA
Long Point	8/10/2024 21:00	IA	No	No	No	NA	NA	NA	Nil	NA

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?[2]	Frequency of Tonality[2,3]	Low-frequency Modifying Factor?[2]	Maximum Exceedance of Reference Spectrum [3,4,6]	Penalty dB[3,4]	Exceedance[3,4,6,7]
South Bulga	8/10/2024 23:22	IA	No	No	No	NA	NA	NA	Nil	NA
Wambo Road	8/10/2024 21:52	IA	No	No	No	NA	NA	NA	Nil	NA
Bulga RFS	14/11/2024 23:32	IA	No	No	No	NA	NA	NA	Nil	NA
Bulga Village	14/11/2024 22:08	<25	No	No	No	NA	NA	NA	Nil	NA
Gouldsville	14/11/2024 21:34	<25	No	No	No	NA	NA	NA	Nil	NA
Inlet Road	14/11/2024 21:23	NM	No	No	No	NA	NA	NA	Nil	NA
Inlet Road West	14/11/2024 21:00	IA	No	No	No	NA	NA	NA	Nil	NA
Long Point	14/11/2024 21:10	IA	No	No	No	NA	NA	NA	Nil	NA
South Bulga	14/11/2024 23:10	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	14/11/2024 21:50	<20	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	12/12/2024 23:39	<30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	12/12/2024 22:12	34	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	12/12/2024 21:25	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road	12/12/2024 21:34	34	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road West	12/12/2024 21:00	33	Yes	No	No	NA	No	NA	Nil	NA
Long Point	12/12/2024 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	13/12/2024 0:36	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	12/12/2024 22:42	34	Yes	No	No	NA	No	NA	Nil	NA

Notes:
1. IA denotes 'Inaudible';
2. Yes/No denote modifying factor was or was not applied.
3. NA denotes 'not applicable';
4. Bold results indicate that application of NPfI modifying factor/s is required
5. Follow up measurement.
6. Bold results in red indicate exceedance of relevant limit.
7. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 6: Mount Thorley Operations Low Frequency Noise Assessment – 2024

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[2]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [2,3]	Penalty dB[3]	Exceedance
Bulga RFS	18/01/2024 23:22	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	18/01/2024 22:08	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	18/01/2024 21:20	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	18/01/2024 21:25	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	18/01/2024 21:05	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	18/01/2024 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	18/01/2024 23:03	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	18/01/2024 21:47	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	1/02/2024 23:25	35	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga Village	1/02/2024 22:43	<30	Yes	No	No	N/A	No	N/A	Nil	NA
Gouldsville	1/02/2024 21:21	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road	1/02/2024 21:50	<30	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road [5]	7/02/2024 21:07	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road [5]	8/02/2024 22:45	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road West	1/02/2024 21:21	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Long Point	1/02/2024 21:00	IA	Yes	No	No	N/A	No	N/A	Nil	NA
South Bulga	2/02/2024 0:21	33	Yes	No	No	N/A	No	N/A	Nil	NA
Wambo Road	1/02/2024 22:19	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga RFS	13/03/2024 22:52	32	No	N/A	N/A	N/A	N/A	N/A	Nil	NA
Bulga Village	13/03/2024 22:10	<30	Yes	No	No	N/A	No	N/A	Nil	NA
Gouldsville	13/03/2024 21:27	IA	Yes	No	No	N/A	No	N/A	Nil	NA

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[2]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [2,3]	Penalty dB[3]	Exceedance
Inlet Road	13/03/2024 21:22	30	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road West	13/03/2024 21:00	28	Yes	No	No	N/A	No	N/A	Nil	NA
Long Point	13/03/2024 21:05	IA	Yes	No	No	N/A	No	N/A	Nil	NA
South Bulga	13/03/2024 23:38	<30	Yes	No	No	N/A	No	N/A	Nil	NA
Wambo Road	13/03/2024 21:48	27	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga RFS	22/04/2024 23:11	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga Village	22/04/2024 22:30	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Gouldsville	22/04/2024 21:25	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road	22/04/2024 21:28	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road [5]	29/04/2024 22:00	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road West	22/04/2024 21:01	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Long Point	22/04/2024 21:00	IA	Yes	No	No	N/A	No	N/A	Nil	NA
South Bulga	22/04/2024 23:52	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Wambo Road	22/04/2024 22:05	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga RFS	7/05/2024 23:03	<25	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga Village	7/05/2024 22:18	NM	Yes	No	No	N/A	No	N/A	Nil	NA
Gouldsville	7/05/2024 22:21	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road	7/05/2024 21:25	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road [5]	13/05/2024 22:00	NM	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road West	7/05/2024 21:00	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Long Point	7/05/2024 21:48	IA	Yes	No	No	N/A	No	N/A	Nil	NA
South Bulga	7/05/2024 23:52	31	Yes	No	No	N/A	No	N/A	Nil	NA

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[2]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [2,3]	Penalty dB[3]	Exceedance
Wambo Road	7/05/2024 21:55	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga RFS	4/06/2024 22:48	31	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga Village	4/06/2024 22:07	<30	No	N/A	N/A	N/A	N/A	N/A	N/A	NA
Gouldsville	4/06/2024 21:26	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road	4/06/2024 21:21	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road West	4/06/2024 21:00	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Long Point	4/06/2024 21:00	28	Yes	No	No	N/A	No	N/A	Nil	NA
South Bulga	4/06/2024 23:36	<20	Yes	No	No	N/A	No	N/A	Nil	NA
Wambo Road	4/06/2024 21:46	31	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga RFS	9/07/2024 23:13	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga Village	9/07/2024 22:24	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Gouldsville	9/07/2024 21:24	<30	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road	9/07/2024 21:29	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road West	9/07/2024 21:00	IA	No	No	No	N/A	No	N/A	Nil	NA
Long Point	9/07/2024 21:00	<20	No	No	No	N/A	No	N/A	Nil	NA
South Bulga	10/07/2024 0:11	<25	No	No	No	N/A	No	N/A	Nil	NA
Wambo Road	9/07/2024 21:57	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga RFS	6/08/2024 22:57	35	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga Village	6/08/2024 22:13	<30	Yes	No	No	N/A	No	N/A	Nil	NA
Gouldsville	6/08/2024 21:20	IA	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road	6/08/2024 21:24	<30	Yes	No	No	N/A	No	N/A	Nil	NA
Inlet Road West	6/08/2024 21:00	<25	No	No	No	N/A	No	N/A	Nil	NA

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[2]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [2,3]	Penalty dB[3]	Exceedance
Long Point	6/08/2024 21:00	IA	No	No	No	N/A	No	N/A	Nil	NA
South Bulga	6/08/2024 23:40	33	No	No	No	N/A	No	N/A	Nil	NA
Wambo Road	6/08/2024 21:48	<30	Yes	No	No	N/A	No	N/A	Nil	NA
Bulga RFS	2/09/2024 23:15	<20	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	2/09/2024 22:29	IA	No	No	No	NA	NA	NA	Nil	NA
Gouldsville	2/09/2024 21:00	IA	No	No	No	NA	NA	NA	Nil	NA
Inlet Road	2/09/2024 21:35	IA	No	No	No	NA	NA	NA	Nil	NA
Inlet Road West	2/09/2024 21:12	IA	Yes	No	No	NA	No	NA	Nil	NA
Long Point	2/09/2024 21:22	IA	No	No	No	NA	NA	NA	Nil	NA
South Bulga	3/09/2024 0:08	IA	No	No	No	NA	NA	NA	Nil	NA
Wambo Road	2/09/2024 22:02	IA	No	No	No	NA	NA	NA	Nil	NA
Bulga RFS	8/10/2024 23:02	IA	No	No	No	NA	NA	NA	Nil	NA
Bulga Village	8/10/2024 22:15	IA	No	No	No	NA	NA	NA	Nil	NA
Gouldsville	8/10/2024 21:23	IA	No	No	No	NA	NA	NA	Nil	NA
Inlet Road	8/10/2024 21:25	IA	No	No	No	NA	NA	NA	Nil	NA
Inlet Road West	8/10/2024 21:00	IA	No	No	No	NA	NA	NA	Nil	NA
Long Point	8/10/2024 21:00	IA	No	No	No	NA	NA	NA	Nil	NA
South Bulga	8/10/2024 23:22	IA	No	No	No	NA	NA	NA	Nil	NA
Wambo Road	8/10/2024 21:52	27	No	No	No	NA	NA	NA	Nil	NA
Bulga RFS	14/11/2024 23:32	<20	No	No	No	NA	NA	NA	Nil	NA
Bulga Village	14/11/2024 22:08	<20	No	No	No	NA	NA	NA	Nil	NA
Gouldsville	14/11/2024 21:34	IA	No	No	No	NA	NA	NA	Nil	NA

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[2]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [2,3]	Penalty dB[3]	Exceedance
Inlet Road	14/11/2024 21:23	IA	No	No	No	NA	NA	NA	Nil	NA
Inlet Road West	14/11/2024 21:00	IA	No	No	No	NA	NA	NA	Nil	NA
Long Point	14/11/2024 21:10	IA	No	No	No	NA	NA	NA	Nil	NA
South Bulga	14/11/2024 23:10	<20	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	14/11/2024 21:50	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga RFS	12/12/2024 23:39	32	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	12/12/2024 22:12	<35	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	12/12/2024 21:25	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road	12/12/2024 21:34	<30	Yes	No	No	NA	No	NA	Nil	NA
Inlet Road West	12/12/2024 21:00	<30	Yes	No	No	NA	No	NA	Nil	NA
Long Point	12/12/2024 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	13/12/2024 0:36	<35	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	12/12/2024 22:42	<30	Yes	No	No	NA	No	NA	Nil	NA

Notes:
1. IA denotes 'Inaudible';
2. Yes/No denote modifying factor was or was not applied.
3. NA denotes 'not applicable';
4. Bold results indicate that application of NPfI modifying factor/s is required
5. Follow up measurement.
6. Bold results in red indicate exceedance of relevant limit.
7. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

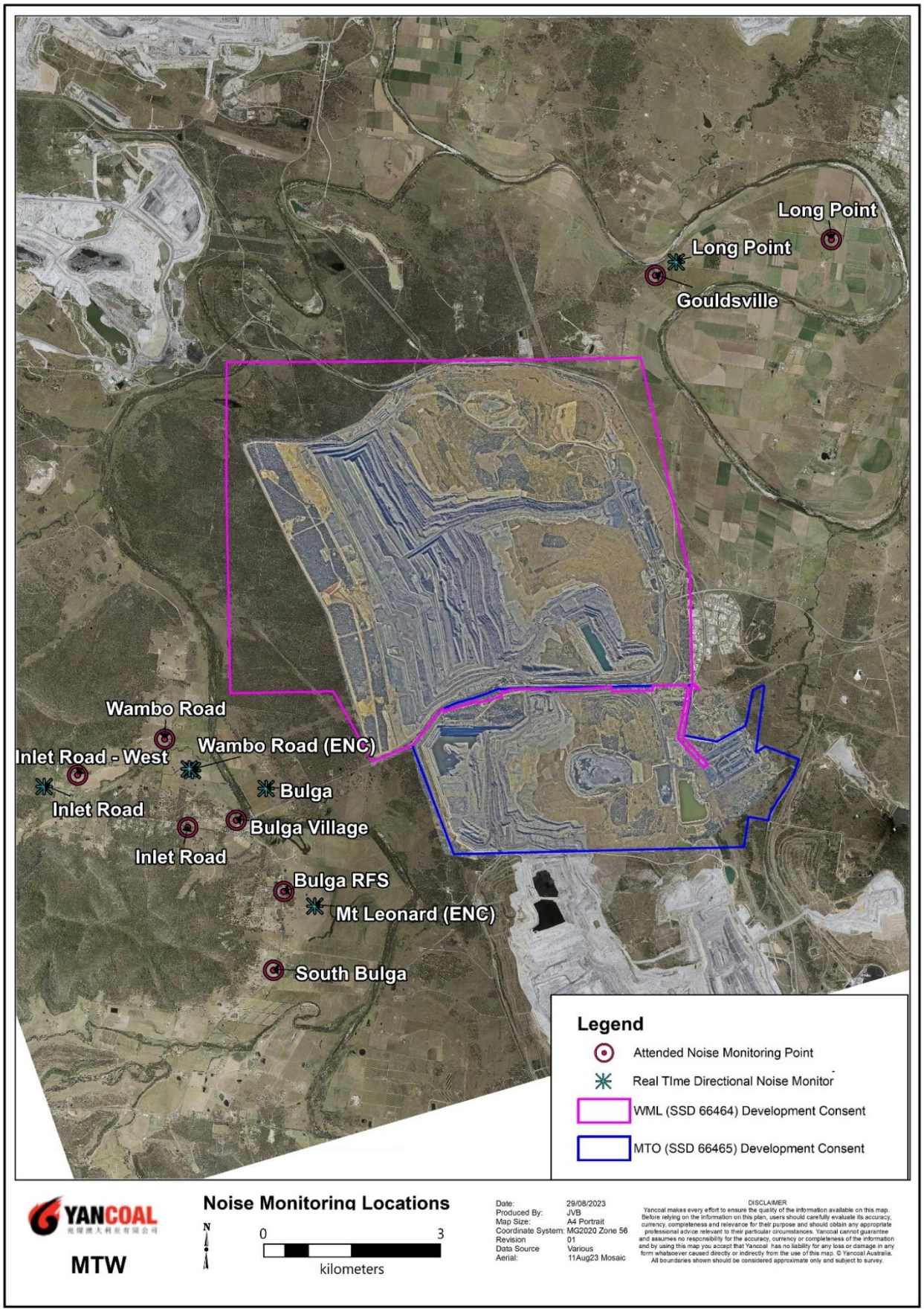


Figure 1: Noise Monitoring Location Plan.

Appendix 2:

Summary of 24 Hour PM10 Exceedance Investigations



Summary of 24 Hour PM_{10} Exceedance Investigations

Yancoal Mt Thorley Warkworth

2024

TABLE 1 24 HOUR PM_{10} INVESTIGATIONS - 2024

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Maximum Estimated contribution from MTW ($\mu g/m^3$)	Discussion
22/01/2024	Warkworth TEOM	60.3	28.3	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 28.3µg/m3 or ~47% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
26/01/2024	Warkworth TEOM	61.3	6.3	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 6.3µg/m3 or ~11% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
04/02/2024	Warkworth TEOM	56.9	19.2	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 19.2µg/m3 or ~34% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
05/02/2024	Warkworth TEOM	54.8	13.3	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 13.3µg/m3 or ~26% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Maximum Estimated contribution from MTW ($\mu g/m^3$)	Discussion
05/02/2024	Long Point HVAS	65.0	25.5	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 25.5µg/m3 or ~40% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
31/05/2024	Warkworth TEOM	54.1	0.0	An analysis of meteorological data has determined that the wind direction was not from MTW's angle of influence and as such, MTW was not a contributor to the result.
29/06/2024	Warkworth TEOM	51.3	2.7	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 2.7µg/m3 or ~6% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
20/07/2024	Warkworth TEOM	54.4	0.0	An analysis of meteorological data has determined that the wind direction was not from MTW's angle of influence and as such, MTW was not a contributor to the result.
31/08/2024	Warkworth TEOM	70.6	0.0	An analysis of meteorological data has determined that the wind direction was not from MTW's angle of influence and as such, MTW was not a contributor to the result.
01/09/2024	Warkworth TEOM	54.4	0.0	An analysis of meteorological data has determined that the wind direction was not from MTW's angle of influence and as such, MTW was not a contributor to the result.

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Maximum Estimated contribution from MTW ($\mu g/m^3$)	Discussion
02/09/2024	Warkworth TEOM	70.3	0.3	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 0.3µg/m3 or ~1% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
05/09/2024	Warkworth TEOM	53.1	0.0	An analysis of meteorological data has determined that the wind direction was not from MTW's angle of influence and as such, MTW was not a contributor to the result.
07/09/2024	Warkworth TEOM	65.7	27.6	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 27.6µg/m3 or ~43% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
08/09/2024	Warkworth TEOM	61.6	10.1	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 10.1µg/m3 or ~17% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
18/09/2024	Warkworth TEOM	58.3	1.0	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 1.0µg/m3 or ~2% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Maximum Estimated contribution from MTW ($\mu g/m^3$)	Discussion
19/09/2024	Warkworth TEOM	53.7	0.9	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 0.9µg/m3 or ~2% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
20/09/2024	Warkworth TEOM	58.3	0.0	An analysis of meteorological data has determined that the wind direction was not from MTW's angle of influence and as such, MTW was not a contributor to the result.
21/09/2024	Warkworth TEOM	72.2	0.2	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 0.2µg/m3 or ~1% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
22/09/2024	Warkworth TEOM	51.8	0.0	An analysis of meteorological data has determined that the wind direction was not from MTW's angle of influence and as such, MTW was not a contributor to the result.
23/09/2024	Warkworth TEOM	75.4	2.1	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 2.1µg/m3 or ~3% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Maximum Estimated contribution from MTW ($\mu g/m^3$)	Discussion
24/9/2024	Bulga TEOM	60.2	5.4	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 5.4µg/m3 or ~10% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
24/9/2024	Wambo Road TEOM	57.3	3.4	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 3.4µg/m3 or ~7% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
24/09/2024	Warkworth TEOM	54.8	10.6	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 10.6µg/m3 or ~20% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
25/09/2024	Wambo Road TEOM	52.5	0.2	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 0.2µg/m3 or ~1% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Maximum Estimated contribution from MTW ($\mu g/m^3$)	Discussion
25/09/2024	Warkworth TEOM	65.5	8.2	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 8.2µg/m3 or ~13% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
23/10/2024	Warkworth TEOM	50.4	10.7	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 10.7µg/m3 or ~23% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
4/11/2024	Warkworth TEOM	63.0	8.0	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 8.0µg/m3 or ~14% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
13/12/2024	Warkworth TEOM	66.3	29.6	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 29.6µg/m3 or ~45% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Maximum Estimated contribution from MTW ($\mu g/m^3$)	Discussion
27/12/2024	Warkworth TEOM	56.7	9.3	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 9.3µg/m3 or ~17% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW is not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.

Appendix 3:

Aboriginal Heritage Management Plan Compliance Inspection Report

Mount Thorley Warkworth Aboriginal Heritage Management Plan 2024 Compliance Audit Inspection

Report prepared for

Yancoal Australia, Mount Thorley Warkworth



February 2025

Joel Deacon

ARROW
HERITAGE SOLUTIONS

Introduction

Yancoal Australia (Yancoal) manage the Mount Thorley Warkworth (MTW) mining complex located in the Hunter Valley, approximately 8km south-west of Singleton. Approval for the continuation and expansion of the mine was granted on 26 November 2015 under two separate project approvals: the Warkworth Continuation Project Approval (SSD-6464) and the Mount Thorley Operations Project Approval (SSD-6465).

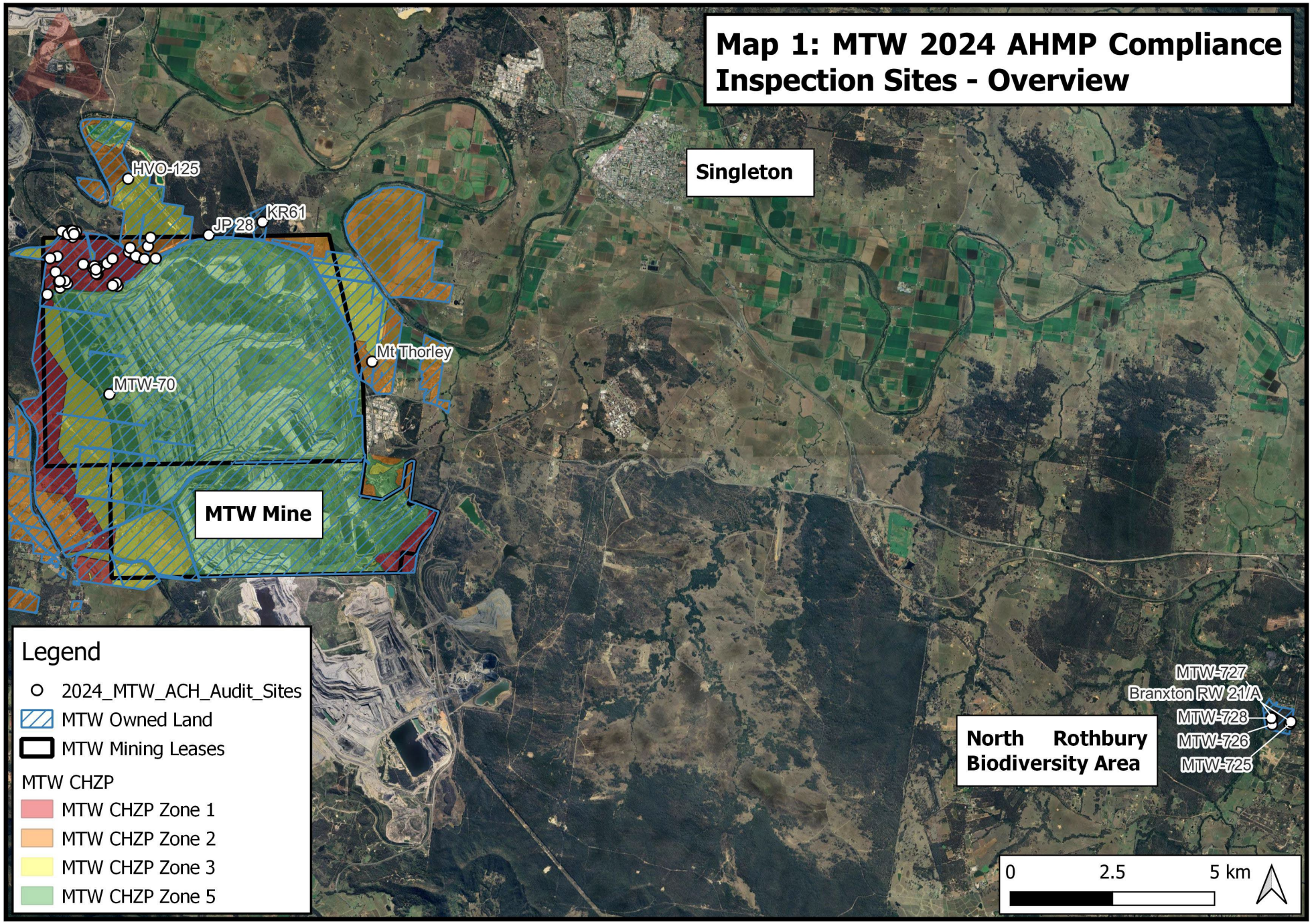
Pursuant to Condition 43 of the Warkworth Continuation Project Approval and Condition 28 of the Mount Thorley Operations Project Approval, Yancoal developed an Aboriginal Heritage Management Plan (AHMP) to cover both mining operations which was first approved by the Department of Planning and Environment on 29 May 2017 and, most recently, on 12 August 2022 (Version 4.0). This AHMP sets out the principles, processes and measures through which Aboriginal cultural heritage (ACH) will be managed within the AHMP Area. This includes a commitment (Provision 25) to conduct annual AHMP compliance inspections with members of the Aboriginal community, through the auspices of the MTW Aboriginal Cultural Heritage Working Group (CHWG), throughout the life of operations. The purpose of the compliance inspections is to afford the Aboriginal stakeholders and MTW:

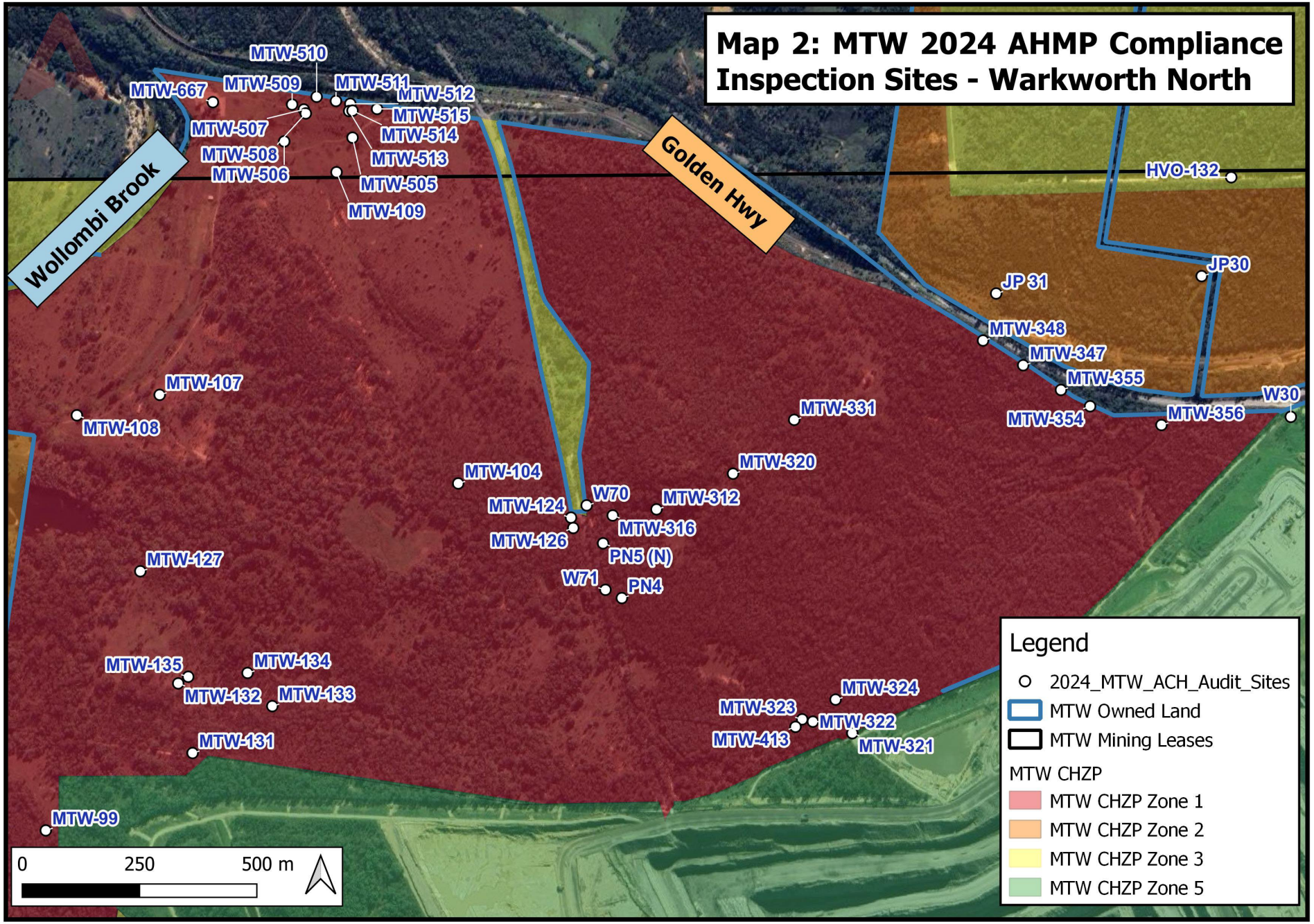
- the opportunity to visit mine operations and mine areas to inspect the operational compliance with AHMP provisions and Ground Disturbance Permit procedures;
- to inspect and monitor the condition and management of various sites over time; and
- to review the effectiveness and performance of AHMP provisions in the management of cultural heritage at the mine.

These compliance inspections are conducted at least annually. Due to the number of ACH sites at MTW and the time required to inspect all sites it is not feasible to inspect every site during the same field trip. Therefore, an annual, rolling program of compliance inspections has been implemented that will visit all sites progressively over a number of years. A record will be kept of each compliance inspection so that it can be ensured that each site is inspected regularly.

Proposed Activity and Project Brief

The 2024 compliance audit involved the inspection of 57 extant ACH sites, and two salvaged grinding grooves sites, located across MTW lands. At each site an AHMP compliance inspection proforma was completed noting evidence of compliance or non-compliance with AHMP provisions, recommendations on modifications and improvements to management provisions, and recommendations on corrective actions. A photographic record was also completed for the inspected ACH sites.


Map 1: MTW 2024 AHMP Compliance Inspection Sites - Overview
Singleton
HVO-125
JP 28
KR61
Mt Thorley
MTW-70
MTW Mine
North Rothbury Biodiversity Area
MTW-727
Branxton RW 21/A
MTW-728
MTW-726
MTW-725
Legend
2024_MTW_ACH_Audit_Sites
MTW Owned Land
MTW Mining Leases
MTW CHZP
MTW CHZP Zone 1
MTW CHZP Zone 2
MTW CHZP Zone 3
MTW CHZP Zone 5
0
2.5
5 km


Map 2: MTW 2024 AHMP Compliance Inspection Sites - Warkworth North
Wollombi Brook
Golden Hwy
MTW-510
MTW-667
MTW-509
MTW-511
MTW-512
MTW-515
MTW-507
MTW-514
MTW-508
MTW-513
MTW-506
MTW-505
MTW-109
HVO-132
JP30
JP 31
MTW-348
MTW-347
MTW-355
W30
MTW-354
MTW-356
MTW-107
MTW-108
MTW-331
MTW-104
MTW-320
W70
MTW-124
MTW-312
MTW-316
MTW-126
PN5 (N)
MTW-127
W71
PN4
MTW-135
MTW-134
MTW-132
MTW-133
MTW-131
MTW-324
MTW-323
MTW-322
MTW-413
MTW-321
MTW-99
0
250
500 m
Legend
2024_MTW_ACH_Audit_Sites
MTW Owned Land
MTW Mining Leases
MTW CHZP
MTW CHZP Zone 1
MTW CHZP Zone 2
MTW CHZP Zone 3
MTW CHZP Zone 5

Timing & Personnel

The 2024 MTW AHMP compliance inspection program was conducted on Monday 25th and Tuesday 26th November 2024. The personnel involved in these inspections were:

Name	Position/Organisation
Joel Deacon	Archaeologist, Arrow Heritage Solutions
Robert Carter	Environment and Community Advisor
Shai-Lee Braneley	CHWG representative
Tara Roberts	CHWG representative

Arrow Heritage Solutions were engaged as independent heritage consultants to conduct the AHMP compliance inspections, and Joel Deacon acted as technical advisor and author of this report. MTW Environment and Community Advisor Robert Carter arranged the compliance inspection programs and escorted the field team. CHWG representatives from Wonnarua Nation Aboriginal Corporation and Culturally Aware participated in the field work program.

MTW AHMP Compliance Inspection

A total of 57 extant ACH sites were inspected at both Mount Thorley Warkworth Mine and the North Rothbury Biodiversity Area (see Maps 1 and 2). The inspection areas were selected as they either included ACH sites for which minimal or incomplete information was held, or were within conservation areas that are currently managed for the protection of biodiversity and ACH values. Additionally, two previously salvaged and relocated grinding groove sites were inspected at the Putty Road Cultural Heritage Storage Facility.

Methodology & Results

Table 1 shows the results of the 2024 MTW compliance inspection and summarises the information recorded on the individual proforma inspection sheets. Using a mobile mapping device pre-loaded with the GIS co-ordinates for each ACH site, the field team travelled to each location and attempted to re-locate each site. Sometimes this was not possible due to poor ground surface visibility (GSV), a result which, in itself, was not overly significant as long as it was determined that the vicinity had not been disturbed. The presence and condition of barricading or fencing was noted, as well as the presence and nature of various potential site disturbing factors (e.g. erosion, animal, human). Pertinent observations of each site were made and, based on information provided for all the above factors, management recommendations were discussed and agreed by the field team for each site if necessary.

Site Name	AHIMS ID	Date	Site re-identified?	Site intact?	Site fenced/ barricaded?	Fencing/ barricading intact?	Natural erosion	Livestock damage	Human disturbance	Animal disturbance	Pests & weeds	General observations	Management recommendations
Branxton RW 21/A	37-6-2256	26/11/24	Yes	Yes	Yes	Yes	No	No	In gateway	No	No	North Rothbury Biodiversity Area	
HVO-125	37-6-1756	25/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No		
HVO-132	37-6-1763	25/11/24	Yes	Yes	Yes	Yes	Severe	No	No	No	No		
JP 28	37-6-1449	25/11/24	No	No	No	-	No	No	Rail corridor	No	No	Site point located upon rail embankment with vicinity totally disturbed	Check AHIMS status with reference to Wambo AHIP
JP 30	37-6-0991	25/11/24	Yes	Yes	No	-	On old dam	No	No	No	No	Area disturbed	
JP 31	37-6-1450	25/11/24	No	Yes	No	-	No	No	On edge of rail line	No	No	Area disturbed	Check AHIMS status with reference to Wambo AHIP
KR61	37-6-2066	25/11/24	No	Yes	No	-	No	No	Powerline corridor	No	No		Check Powerline AHIP for validity: UPDATE – NOT NAMED IN AHIP
Mt Thorley	37-6-0020	25/11/24	No	?	No	-	No	No	On edge of rail line	No	No		Check AHIMS status with reference to Wambo AHIP
MTW-104	37-6-2403	25/11/24	No	Yes	No	-	No	No	No	No	No		
MTW-107	37-6-2406	25/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-108	37-6-2407	25/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-109	37-6-2408	26/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No	Demarcated by posts only - adequate	
MTW-124	37-6-2423	25/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-126	37-6-2425	25/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-127	37-6-2426	25/11/24	No	Yes	Yes	No	No	No	No	No	No		
MTW-131	37-6-2430	25/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-132	37-6-2431	25/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-133	37-6-2432	25/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-134	37-6-2433	26/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-135	37-6-2434	26/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-312	37-6-1268	26/11/24	No	Yes	Yes	Yes	No	No	On old track	No	No		
MTW-316	37-6-1270	26/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-320	37-6-1267	26/11/24	Yes	Yes	Yes	No	No	No	On old track	No	No		

Site Name	AHIMS ID	Date	Site re-identified?	Site intact?	Site fenced/ barricaded?	Fencing/ barricading intact?	Natural erosion	Livestock damage	Human disturbance	Animal disturbance	Pests & weeds	General observations	Management recommendations
MTW-321	37-6-2611	26/11/24	Yes	Yes	Yes	Yes	No	No	On old track	No	No	Scarred tree - healthy but recent limb fall	
MTW-322	37-6-2612	26/11/24	Yes	Yes	No	-	No	No	No	No	No	Scarred tree	
MTW-323	37-6-2613	26/11/24	Yes	Yes	No	-	No	No	No	No	No	Scarred tree	
MTW-324	37-6-2614	26/11/24	Yes	Yes	No	-	No	No	No	No	No	Scarred tree	
MTW-331	37-6-2621	26/11/24	Yes	Yes	Yes	No	No	No	Edge of old track	No	No		
MTW-347	37-6-2630	26/11/24	No	Yes	Yes	Yes	No	No	Edge of old track	No	No		
MTW-348	37-6-2631	26/11/24	No	Yes	Yes	No	No	No	No	No	No		
MTW-354	37-6-2637	26/11/24	Yes	Yes	Yes	No	No	No	On track	No	No		
MTW-355	37-6-2638	26/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No	2 additional artefacts found	Increase site extent to include new finds
MTW-356	37-6-1260	26/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-413	37-6-2694	26/11/24	Yes	Yes	No	-	No	No	No	No	No	Scarred tree	
MTW-505	37-6-2924	26/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No		
MTW-506	37-6-2923	26/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
MTW-507	37-6-2925	26/11/24	Yes	Yes	Yes	Yes	No	No	On old track	No	No	2 flakes on track	Extend barricading and explore options to re-route track
MTW-508	37-6-2926	26/11/24	No	Yes	No	-	No	No	No	No	No	v. poor GSV	
MTW-509	37-6-2927	26/11/24	Yes	Yes	Yes	Yes	Some	No	No	No	No	6 additional artefacts found	Extend barricading to cover all of erosion area, explore options to re-route track
MTW-510	37-6-2928	26/11/24	No	Yes	Yes	Yes	No	No	No	No	No	v. poor GSV	
MTW-511	37-6-2929	26/11/24	No	Yes	No	-	No	No	No	No	No		
MTW-512	37-6-2930	26/11/24	No	Yes	No	-	No	No	No	No	No		
MTW-513	37-6-2931	26/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No	Barricaded with MTW-514	Explore options to re-route track
MTW-514	37-6-2936	26/11/24	Yes	Yes	Yes	Yes	No	No	No	No	No	Barricaded with MTW-513	Explore options to re-route track
MTW-515	37-6-2937	26/11/24	No	Yes	No	-	No	No	No	No	No		
MTW-667	37-6-3619	26/11/24	Yes	Yes	No	-	No	No	At Springwood	No	No	On veranda	Effectively demarcate when works at homestead

Site Name	AHIMS ID	Date	Site re-identified?	Site intact?	Site fenced/ barricaded?	Fencing/ barricading intact?	Natural erosion	Livestock damage	Human disturbance	Animal disturbance	Pests & weeds	General observations	Management recommendations
MTW-70	37-6-2369	25/11/24	Yes	Yes	Yes	No	No	No	No	No	Termites	Scarred tree	Reinstate barricading and signage, monitor annually ahead of mining and disturbance decision
MTW-725	37-6-3940	26/11/24	No	Yes	Yes	Yes	No	No	On old track	No	No	North Rothbury Biodiversity Area	
MTW-726	37-6-3941	26/11/24	No	Yes	Yes	Yes	No	No	No	Pig rooting	No	North Rothbury Biodiversity Area	
MTW-727	37-6-3942	26/11/24	No	Yes	Yes	Yes	No	No	No	No	No	North Rothbury Biodiversity Area	
MTW-728	37-6-3943	26/11/24	No	Yes	Yes	No	No	No	No	No	No	North Rothbury Biodiversity Area	
MTW-99	37-6-2398	25/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
PN4	37-6-2705	26/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
PN5 (N)	37-6-2706	26/11/24	No	Yes	Yes	Yes	No	No	No	No	No		
W30	37-6-1261	26/11/24	No	No	No	-	No	No	Mining	No	No	In mining area	Check records to see if salvaged
W70	37-6-1239	26/11/24	Yes	Yes	Yes	No	No	No	On old track	No	No	Artefacts found nearby	Move site point to new point
W71	37-6-1241	26/11/24	No	Yes	Yes	Yes	No	No	No	No	No		

Table 1: Results of 2024 MTW AHMP Compliance Inspection

Aboriginal Site Management Recommendations

All ACH site locations visited during the AHMP compliance inspection were found to be intact with no recent damage or unauthorised disturbance noted, however, several site locations require further investigation to confirm their salvage status. Not all ACH sites were able to be re-identified, but this was due to poor GSV or leaf litter obscuring the ground surface rather than due to inadvertent destruction. Management recommendations were provided for many of the ACH sites visited during the 2024 compliance inspection. These recommendations are described below.

Reinstate barricade and signage, continue to monitor annually ahead of mining

Sites: MTW-70

Site MTW-70 is a dead scarred tree located on the edge of the final mining boundary at Warkworth Mine. The tree is standing but is in a fragile state due to having been burnt and currently infested with termites. The site has been previously discussed with the MTW CHWG many times and is currently intended to be salvaged or re-assessed ahead of future mining disturbance. Until that time, the tree should be effectively barricaded and sign-posted for its protection as mining works continue to increase in the area.



The tree should be inspected annually until an ultimate decision is made as to its ability to be salvaged. Due to its fragile nature, a successful removal program is unlikely. Ongoing annual inspections will provide status information to the MTW CHWG and allow that group to make informed decisions on the tree's ongoing management.

Effectively demarcate site when works present

Site: MTW-667

This site consists of four stone artefacts found upon and adjacent to the north veranda at Springwood Homestead (see red circle on photograph below). It is unclear whether these artefacts had been previously collected and placed in their current location, or are sited close to their original provenance. In either event, they constitute an AHIMS site located in an ACH Conservation Area and must be protected.



Springwood Homestead is frequently the subject of historical heritage work programs, with personnel engaged in structural remediation, vegetation management and general maintenance activities. While these activities are underway, effective demarcation or barricading of this site should be established, with information and avoidance measures communicated to workers in relevant permits, if necessary.

Explore options to re-route track

Site: MTW-507, 509, 513, 514,

There are several sites located immediately adjacent to, and occasionally intersecting with, the existing access track to Springwood homestead. As this track is used regularly, it would be prudent to re-route that section located in the vicinity of these sites. As shown in the image below there are several constraints to moving the existing track (white dashed line). In addition to the existing ACH sites (red dots), the MTW land ownership boundary (red line) is located only c.25m north of the track, a tree replanting plot (green stipple) is located to its south, and two ephemeral watercourses (blue lines) create boggy conditions after rainfall in the area.

Despite these challenges, an alternative route to that currently used would be beneficial to the protection of the ACH sites in the vicinity. In the meantime, those sites in proximity to the track should be barricaded for their protection from vehicles inadvertently straying off track. In addition, the extents of these sites are to be extended to incorporate new finds recorded during the current audit.



Investigate AHIMS status with relevance to previous AHIPs

Sites: JP28, JP31, KR61, Mt Thorley, W30

These five sites were inspected to confirm their validity status. It is possible that all sites were named in previous AHIP consents, however, evidence regarding this and their potential salvage was not clear in documents held by MTW, AHIMS or neighbouring land-holders. Upon inspection, it was clear that all sites were located in heavily disturbed areas and no Aboriginal material was able to be relocated at, or in the vicinity of, the recorded site co-ordinates.

It is recommended that site W30 be deemed salvaged under the auspices of AHIP consent #1131171 (within which its disturbance was authorised), and that the AHIMS register be updated to change this site's validity to destroyed.

Although it appears that sites JP28, JP31 and Mt Thorley have been destroyed, likely during the construction of the Wambo spur rail-line, a valid AHIP covering these sites has not currently been sighted. Salvage programs conducted between 2004-6 pursuant to AHIPs (#2085 and #2022) granted to Wambo Mine may have included these three sites and should be checked to clarify these sites' status. Until this occurs, the sites should be deemed to remain valid and protected from further harm.

Note a further site, KR61, that was not able to be re-identified during the current inspection has not been subject to any previous AHIP and, therefore, remains valid.



Location of JP 28 on railway embankment



Location of KR61 within powerline corridor

Update MTW ACH databases to incorporate new inspection information

Sites: MTW-355, W70

During the course of the current audit inspection, finds at two ACH sites provided updated information that should be used to update the MTW ACH sites and site extents databases.

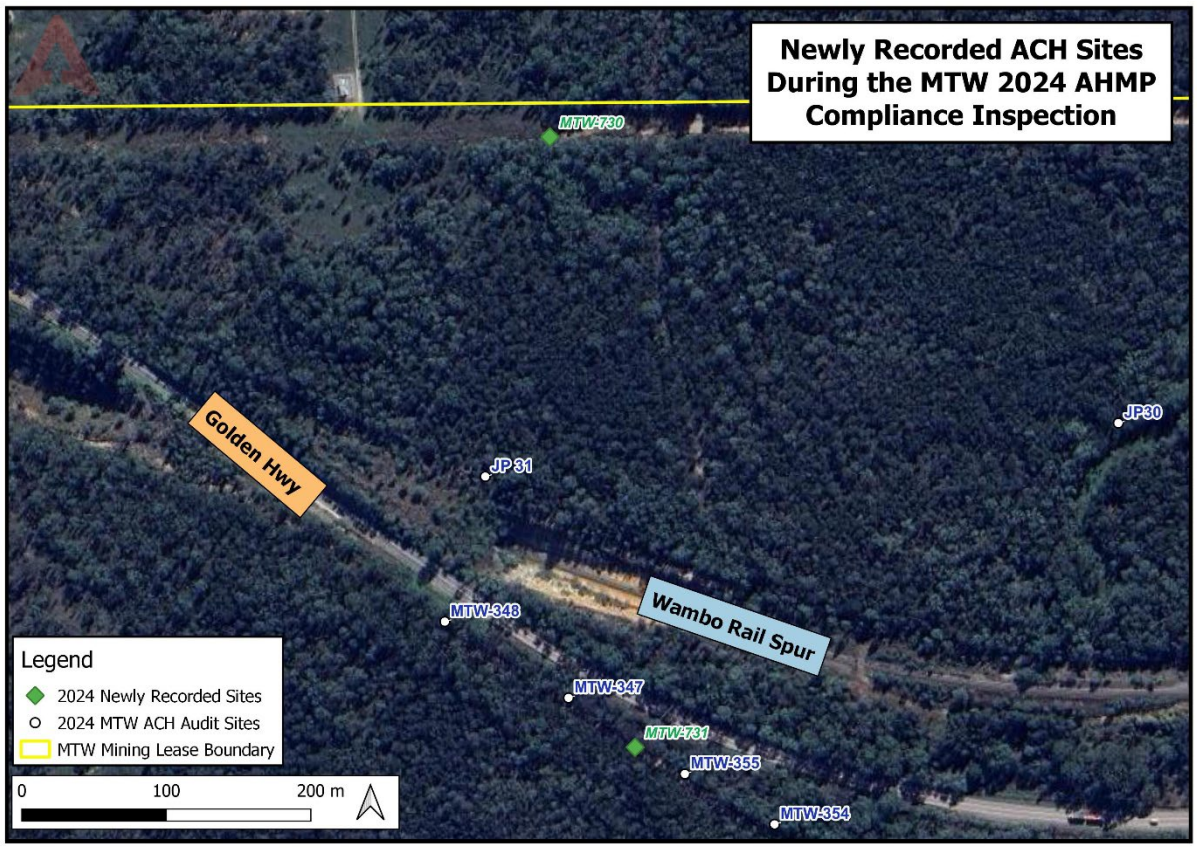
Two additional artefacts were identified outside of the current mapped extent of ACH site MTW-355. The co-ordinates of these artefacts were noted and it is recommended that the MTW ACH site extents database be updated to increase the extent of this site to include these new finds.

During the thorough inspection of W70, initially recorded in 2004, the artefact noted in the site report was unable to be re-located. However, three mudstone artefacts were identified c.30m

to the south-east. Considering the vagaries of GPS technology two decades ago, and the considerable tree cover in the area (that can affect GPS readings) it is recommended that the site point recorded within the MTW ACH sites database be amended to reflect the current finds. An Aboriginal Site Impact Recording Form should also be submitted to AHIMS to update their database.

Newly Recorded ACH Sites

During the course of the current audit, two additional previously unrecorded ACH sites were located by the field team in the north of the Warkworth lease (shown on map below). These sites have been added to the MTW ACH Sites database and also registered on AHIMS.



MTW-730 (37-6-4449)

316162E 6393389N (GDA94z56)

This site consists of a single mudstone flake located on an erosion scald adjacent to an erosion affected track. The site is located along the northern boundary of the Warkworth mining lease and c.100m west of an ephemeral watercourse. GSV in this area was excellent, with the nearest previously recorded site 150m to the north.



Mudstone flake recorded at MTW-730

<u>MTW-731 (37-6-4450)</u>

316221E 6392967N (GDA94z56)

This site consists of one mudstone flake and two silcrete flakes located on the edge of an erosion affected track. The site is located along a fence-line track south of the Golden Highway and c.160m north-west of Longford Creek. GSV in this area was excellent, with the nearest previously recorded site 40m to the south-east.



Artefacts recorded at MTW-731

Conclusions and Recommendations

The 2024 AHMP compliance inspection has been conducted as per the procedures outlined in the AHMP. No unauthorised site disturbances or AHMP non-compliances were observed during the inspection, and no issues were raised by the CHWG representatives present. A number of recommendations have been made to enhance or assist with the management of ACH at MTW, which are summarised below:

1. **Reinstate barricade and signage at site MTW-70 and continue to monitor annually ahead of mining;**
2. **Effectively demarcate site MTW-667 when works are being conducted at Springwood Homestead;**
3. **Explore options to re-route existing track in the vicinity of MTW-507, 509, 513 and 514 sites;**
4. **Obtain AHIPs #2085 and #2022 (granted to Wambo Mine) to ascertain validity/salvage status of JP28, JP31 and 'Mt Thorley' sites;**
5. **Update status of site W30 to destroyed on MTW and AHIMS databases;**
6. **Update the extents of sites MTW-507, 509, 513 and 355 to accommodate additional finds; and**
7. **Move the GIS point for site W70 to reflect the location of artefacts identified during the current audit and update AHIMS database accordingly.**

Appendix 4:

Historic Heritage Management Plan Compliance Inspection Report

Mount Thorley Warkworth Historic Heritage Management Plan 2024 Compliance Audit Inspection

Report prepared for

Yancoal Australia, Mount Thorley Warkworth



December 2024

Joel Deacon

ARROW
HERITAGE SOLUTIONS

Introduction

Yancoal Australia (Yancoal) manage the Mount Thorley Warkworth (MTW) mining complex located in the Hunter Valley, approximately 8km south-west of Singleton. Approval for the continuation and expansion of the mine was granted on 26 November 2015 under two separate project approvals: the Warkworth Continuation Project Approval (SSD-6464) and the Mount Thorley Operations Project Approval (SSD-6465).

Pursuant to Condition 46 of the Warkworth Continuation Project Approval, Yancoal have developed an MTW Historic Heritage Management Plan (HHMP) that covers the MTW mining complex. The MTW HHMP was approved by the Department of Planning and Environment on 11 October 2017 and sets out the principles, processes and measures through which historic heritage will be managed within the HHMP Area. This includes the commitment (Provision 19) to conduct an annual HHMP compliance inspection. The purpose of the HHMP compliance inspections is to:

a. inspect areas and sites to assess compliance with the provisions of the HHMP and site-specific Conservation Management Plans (CMPs);
b. inspect and monitor the condition and management of various sites; and
c. review the effectiveness and performance of the HHMP provisions in the management of historic heritage at MTW.

Proposed Activity and Project Brief

The following historic sites within the MTW HHMP area (shown on the map below) were inspected to assess compliance with actions listed in the HHMP and specific CMPs. A detailed photographic record for each site was also collated to add to the previous photographic data:

- Former RAAF Base Bulga Mess Hall
- Springwood Homestead
- Mount Thorley Brick Farm House

Timing & Personnel

The 2024 MTW HHMP compliance inspection was conducted between 22-27 November. Arrow Heritage Solutions were engaged as independent heritage consultants to conduct the HHMP compliance inspection, with Joel Deacon acting as technical advisor and author of this report. Robert Carter, MTW Environment and Community Advisor, arranged the compliance inspection program and arranged access to each site.

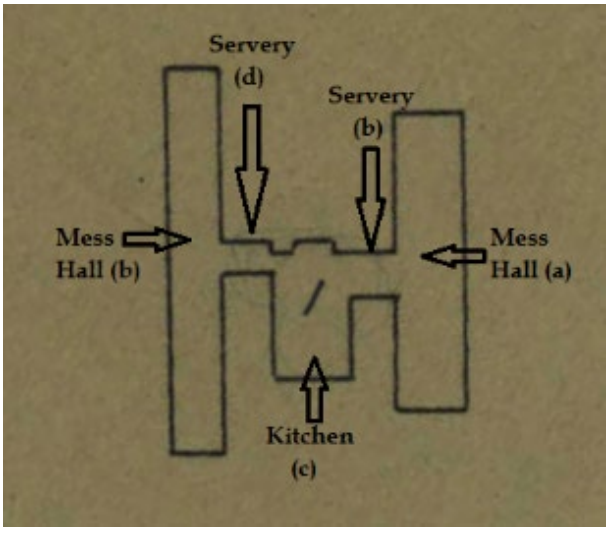

Historic Heritage Sites Inspected
2024 MTW HHMP Compliance Audit
Springwood Homestead
Mount Thorley Red Brick House
Former RAAF Base Bulga Mess Hall
1 0 1 2 3 4 km
Legend
HHMP Audit Sites
Warkworth Continuation DC Boundary
MTW Mining Leases

Former RAAF Base Bulga Mess Hall

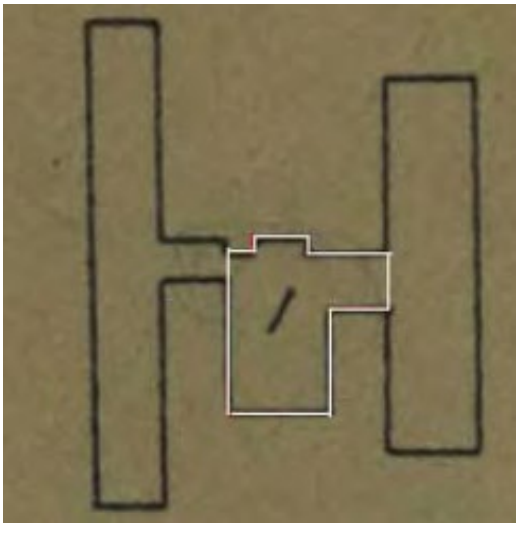
Following the Japanese attack on Pearl Harbour in December 1941, plans were approved to expand existing RAAF bases and establish new ones, including a number of sites in the Hunter Valley. Bulga was identified as a potential site for an operational base and the area was officially taken over by the RAAF on 12 June 1942 for use as a relief landing strip. By July 1943 the site was completed, including the kitchen and mess hall, however, by January 1944 the use of the site was limited due to the decreasing threat of attack. A 1946 condition report noted this building as deteriorating. In January 1953, the building was noted as missing a few sheets of iron and windows.

The building sits in the former camp area west of the north-south runway. It was originally irregular in plan comprising a central kitchen area measuring 13.4 x 8.8m, with long rectangular mess halls to the east and west, connected by a servery on either side. The remnant structure today comprises the kitchen building and the foundation of one of the serveries (see below).

The remnant building is "L" shaped in plan with brick and concrete footings. During the original assessment conducted by ERM in November 2012 (which informed the CMP) the building was noted as being in poor condition with trees physically impacting on the building fabric, and some minor settlement issues resulting in cracking and failing brickwork. The western section of the building was the most intact part, retaining the original timber frame, corrugated asbestos cement roof sheeting and walls clad with corrugated iron sheeting.



Original layout of building



Remaining structure

The building is currently structurally unsound, with a number of timber elements either missing or in a deteriorated state. Corrugated asbestos roof sheeting is also missing in some places, and damaged and in poor condition where it remains. Much of the corrugated iron sheeting

is corroded. Brickwork is also cracking in a number of locations resulting in movement outward, loss of mortar and loss of bricks along the southern and eastern elevations.



View to mess from south-east (2012)



Remnant kitchen area (2012)

As a result, a number of structural recommendations were outlined by ERM in the CMP developed for the site in 2012. These recommendations were not intended to return the building to a serviceable state, rather they sought to do the minimum required to allow safe access to the building to prevent significant damage, and also allow safe access for asbestos removal and internal inspection of the building in the short to medium term.

CMP Requirements

Short to medium term structural recommendations included:

a) **Remove fallen tree branch.** The tree branch impacting on the roof of the building should be removed, using an external mobile elevated platform or boom lift;
b) **Temporary propping.** The building should be temporarily propped and supported as per Bligh Tanner plans SK 1.0 A and SK 2.0 A (contained within the CMP) to allow for safe access into the building and more detailed inspection of the structure.
c) **Asbestos Removal.** Asbestos removal should be completed by a licensed asbestos removal specialist, include the roof sheeting, all asbestos dust and fibres, and loose fragments that are known to exist in the remaining area.
d) **Stabilise framework and replace roof.** Any structural roof members that are destabilized once the roof sheeting is removed are to be secured as required. Side walls which lose stiffness once the roof sheeting has been removed are to be propped temporarily until the new roof has been replaced.
e) **Archaeological clean-up.** Asbestos removal and clean-up should be supervised by a historical archaeologist to ensure any identified items of significance are retained.

f) **Further building inspection.** A structural engineer should complete a building inspection to identify structural repairs and stability requirements with four weeks of the building being cleaned up and decontaminated from asbestos.

Following the internal inspection of the building noted in (f) above, further advice may be provided regarding further recommendations, which, due to the lack of integrity of the building, are unlikely to be directed at restoration, but more towards retaining the remnant structure in a safe environment and reducing further deterioration. Repair drawings have been provided in the CMP to remedy any major cracking in the brickwork or where sections of brickwork have either partially collapsed or broken away from the wall.

Photographic Comparison 2012 through 2024

During the inspection of the Former RAAF Base Bulga Mess Hall for this report, a number of photographs were taken from the same angles and of the same features as were taken during the original ERM 2012 assessment and archival recording as well as during subsequent annual HHMP compliance inspections. These photographs provide a visual baseline condition assessment of the building, and also allow a comparative analysis of the building condition over the last 12 years. The photographs set out below show the condition of the site today in comparison to the 2023 audit, the original 2012 assessment and other selected years where major changes in the site's condition were observed. Comments pertinent to management recommendations for the site are also provided. Where defects have been noted and/or actions have been recommended and remain outstanding, these have been presented in blue text. Where stabilisation or improvement measures have been implemented, these are noted in green text. Previous compliance audit inspection reports can be reviewed for a full photographic archive of the site.

2012	2018
	
2023	**2024**
	

East elevation

2012-18: no discernible change – note fallen branch from tree on western side.

2018-20 (Mar): no discernible change – fallen branch has moved.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: no discernible change.

2022-2023: no discernible change.

2023-2024: no discernible change.

2012	2020 (Mar)
	
2023	**2024**
	

South-east elevation

2012-18: evidence of increased bow to southern wall.

2018-20 (Mar): bow in wall appears to have increased.

Mar 2020 – Dec 2020: bow in wall continues to increase.

Dec 2020 – 2021: gap in bowing has increased.

2021-2022: no discernible change.

2022-2023: bow in wall continues to increase

2023-2024: bow in wall increasing, with some collapse and slumping at near bottom corner

2012	2022
	
2023	**2024**
	

South elevation

2012-18: evidence of increased bow to southern wall and missing panel above entry.

2018-20 (Mar): increased bow to southern wall.

Mar 2020 – Dec 2020: increased bowing on southern wall.

Dec 2020-2021: gap in bowing has increased.

2021-2022: potential subsidence bottom right corner.

2022-2023: increased bowing on southern wall.

2023-2024: missing timbers right hand side of roof, slumping brickwork at bottom right corner

2012	2020 (Mar)
	
2023	**2024**
	

West elevation

2012-18: shows deterioration of roofing members above open kitchen area and leaning north wall, and further collapse of asbestos roof due to fallen dead tree.

2018-20 (Mar): top of north wall now collapsed, further damage to roof with branch now fallen to ground.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020-2021: northern wall on near side of chimney has detached from exposed western beam.

2021-2022: no discernible change

2022-2023: no discernible change

2023-2024: increased animal activity at bottom left corner

2012	2020 (Mar)
	
2023	**2024**
	

North elevation

2012-18: no discernible change.

2018-20 (Mar): top of north wall now collapsed.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020-2021: no discernible change.

2021-2022: no discernible change

2022-2023: no discernible change

2023-2024: no discernible change

2012	2018
	
2023	**2024**
	

Concrete and brick foundation at east side of building

2012-18: difficult to discern change.

2018-20 (Mar): no discernible change.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020-2021: difficult to discern change.

2021-2022: no discernible change

2022-2023: some collapse of internal timber members

2023-2024: snapped timber on right hand side of foundation; motorcycle tracks on foundation surface

2012	2022
	
2023	**2024**
	

Grease trap at south end of building

2012-18: shows bow to south wall.

2018-20 (Mar): shows increased bow to south wall.

Mar 2020 – Dec 2020: shows increasing bowing of south wall, and example of new termite monitoring system in bottom right of picture.

Dec 2020-2021: shows increasing bowing of south wall.

2021-2022: potential subsidence at broken brick corner.

2022-2023: some increased movement at cracked corner

2023-2024: slumping brickwork at cracked corner.

2012	2018
	
2023	**2024**
	

Storage area at south end of building

2012-18: further slight collapse of storage area.

2018-20 (Mar): shows loosening of corrugated iron wall sheeting due to bowing in wall.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020-2021: no discernible change.

2021-2022: no discernible change

2022-2023: further separation of corrugated iron wall sheeting due to bowing in wall.

2023-2024: some movement of loose metal items on ground

2012	2018
	
2023	**2024**
	

Windows and entry at west elevation

2012-18: shows large trunk/branch portions of tree collapsed on roof, which has destroyed roof ventilator.

2018-20 (Mar): shows majority of branches fallen from roof, leaving increased damage to sheeting.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020-2021: no discernible change.

2021-2022: no discernible change.

2022-2023: no discernible change

2023-2024: no discernible change

2012	2018
	
2023	**2024**
	

Timber window detail, west elevation

2012-18: no discernible change.

2018-20 (Mar): no discernible change.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020-2021: no discernible change.

2021-2022: no discernible change

2022-2023: no discernible change

2023-2024: no discernible change

2012	2018
	
2023	**2024**
	

Showing cylindrical ventilator and damage to roof, view from west

2012-18: shows significant roof damage from fallen dead tree, including to ventilator.

2018-20 (Mar): shows increased damage to roof edge sheeting from fallen branch.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020-2021: deterioration of left window frame.

2021-2022: no discernible change

2022-2023: no discernible change

2023-2024: no discernible change

2012	2020 (Mar)
	
2023	**2024**
	

Detail of north-west elevation

2012-18: shows increased collapse over open kitchen area, as well as new damage to brick foundation at north-west corner.

2018-20 (Mar): shows fallen top of north wall plus increased (animal?) damage to brick foundation at north-western corner.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020 – 2021: detachment of north wall from western beam.

2021-2022: no discernible change

2022-2023: some internal timbers have fallen further.

2023-2024: no discernible change

2012	2020 (Mar)
	
2023	**2024**
	

Showing interior damage at kitchen at north end of building

2012-18: shows increased collapse over and accumulation of debris within open kitchen area. Note also severe lean to north wall. Stove doors have become unhinged.

2018-20 (Mar): shows collapsed top of north wall and collapse of remaining full crossbeam. Stove now obscured by collapsed north wall.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: no discernible change

2022-2023: some movement of fallen timbers

2023-2024: some movement of fallen timbers

2012	2018
	
2023	**2024**
	

View to interior of south end of building, view from east

2012-18: shows increased collapse over open kitchen area.

2018-20 (Mar): shows further minor deterioration of asbestos panelling.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: no discernible change

2022-2023: some movement of fallen timbers

2023-2024: breakage to some asbestos panelling, some fallen frame timber

2012	2018
	
2023	**2024**
	

Showing west interior space

2012-18: no discernible change.

2018-20 (Mar): no discernible change.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: no discernible change

2022-2023: no discernible change

2023-2024: some fallen interior sheeting

2012	2018
	
2023	**2024**
	

Damaged brick foundation at south-east corner (south view)

2012-18: no discernible increase to cracked brick foundation.

2018-20 (Mar): further cracking of foundation (to left of shot) and some slumping of corner bricks.

Mar 2020 – Dec 2020: some slight potential further movement in cracked section (also note termite management system in bottom right-hand corner of photograph.

Dec 2020 – 2021: no discernible change.

2021-2022: subsidence noted with buckling beginning between 3rd and 4th course of bricks

2022-2023: potential further slumping to corner

2023-2024: increased bowing to brickwork

2012	2018
	
2023	**2024**
	

Detail of damaged brick foundation (east view)

2012-18: some further collapse of concrete/cement above brick foundation.

2018-20 (Mar): some slumping outwards of corner brick foundation.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020 – 2021: movement and setting of internal concrete piece.

2021-2022: increased cracking along mortar lines

2022-2023: no discernible change

2023-2024: no discernible change

2012	2020 (Mar)
	
2023	**2024**
	

View to interior of building, looking north from south entry

2012-18: no discernible change.

2018-20 (Mar): no discernible interior change but shows collapsed north wall.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: some movement of timbers at front of shot may suggest human interference

2022-2023: movement of prone drum may suggest human or animal interference

2023-2024: movement of several items (drums and plasterboard)

2012	2018
	
2023	**2024**
	

Showing interior of building, viewed from north-west corner

2012-18: shows collapsed roofing members above open kitchen area and accumulation of debris.

2018-20 (Mar): shows additional collapsed roofing member.

Mar 2020 – Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: no discernible change

2022-2023: some movement of fallen timbers

2023-2024: no discernible change

The comparative photographs above show the changes at the building over the past twelve years. Although no substantial changes were noted between the current and the last inspection, other than continuing instability along the southern face and south-eastern corner, no structural maintenance has occurred either. It also appears that trespassers have visited the site, evidenced through the movement of several loose items within and outside the building, and motorcycle tyre tracks on one of the concrete surfaces. No major or minor damage appears to have resulted from this trespass.



Motorcycle tyre marks on concrete foundation to east of kitchen

It can be expected that over the years, the underlying causes of deterioration, such as the degeneration of wooden framework and metal panelling, and animal burrowing underneath the structure, has continued. Therefore, the more significant changes and priority actions identified during previous inspections remain of importance and, if anything, their need of remediation has increased in urgency. Previous recommendations remain valid and the key issues remain:

- Damaged roof sheeting and roofing members, as well as increasing structural instability of bowing southern wall;
- Due to the complete collapse of roofing members over the open kitchen area the top portion of the northern wall has now failed and fallen inside the building footprint. This northern wall has now detached from remnant roofing and west wall members;

- Deterioration of window panelling; and
- Increased damage to brick foundation in north-west corner, and new slumping of south-east foundation corner.

A termite management regime was implemented around the site prior to the 2020 annual inspection and has remained ongoing since this time. Although the last inspection is reported to have occurred in October 2024, at the time of this visit some inspection points appear to have deteriorated and these should be assessed and replaced if required so that any evidence of termite activity can be treated as soon as possible.

It should be noted that a recent condition inspection of the Former RAAF Base Bulga Mess Hall was conducted (Bill Jordan & Associates, 23 April 2024) which confirmed that the original Bligh Tanner structural recommendations remain fit for purpose. This recent inspection also provided interim guidance to support building stability while undertaking the asbestos removal, which has been added to the high priority actions below.

Recommendations

High Priority Actions

1. Engage an asbestos expert to assess and develop a clean-up and disposal plan to deal with both the broken fragments and intact asbestos sheeting, with internal scaffolding to be installed to support the roof structure prior to any works in that area;
2. Remove any remaining tree branches from the roof, with internal scaffolding to be installed to support the roof structure prior to any works in that area. In addition, to prevent similar damage in the future, serious consideration should be given to removing or lopping those trees that are located close enough to the building that they may cause damage if they fall or drop large branches.

High Priority Actions to Follow Actions 1 & 2

3. Pending the results of the asbestos assessment, the building and surrounds should be thoroughly cleaned of asbestos and other rubbish material. An archaeologist should be present to collect any items of historic importance or that relate to the original fabric of the building. This should also include the removal, repair and curation of items such as window frames and panels before their total deterioration. All such items can be stored inside the building and potentially re-used during further stabilization programs;
4. Pending the results of the asbestos assessment, susceptible parts of the building framework, such as roofing members and walls should be stabilized and propped, using the CMP Bligh Tanner plans as a guide;

5. A structural engineer should then inspect the building before any further works are commenced to make further recommendations on stability requirements and structural repairs. These further works should aim to reduce the likelihood and extent of any further deterioration at the site rather than seek to rebuild or renovate as it is unlikely that there would be any valid or appropriate option to re-use the site.

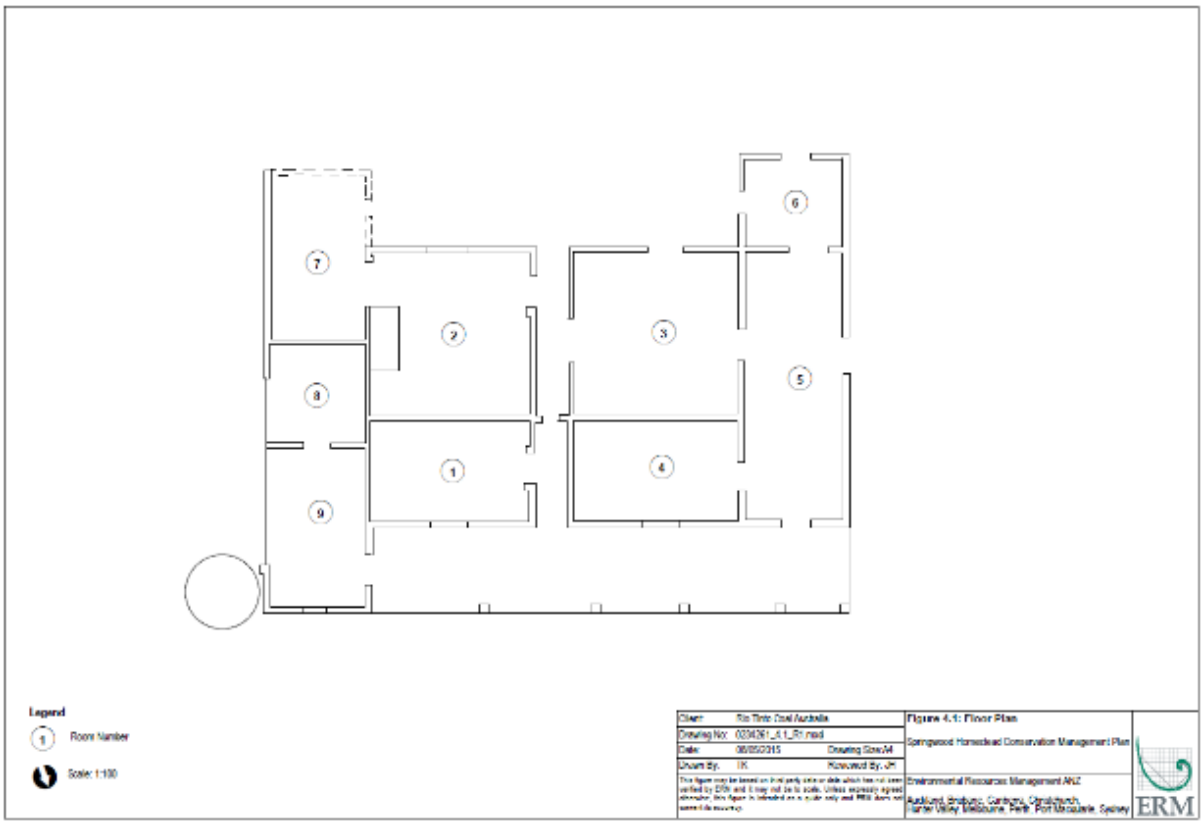
Ongoing

6. Continue with the termite monitoring regime, including an assessment of the integrity of the existing termite inspection pits.

Springwood Homestead

Based on historical research, Springwood Homestead is likely to have been constructed c.1860 and displays many characteristics of late Old Colonial Georgian and Victorian Georgian architecture, including an original shingle broken-backed roof, fanlights or transom lights, panelled doors and under-roof verandas. The homestead is low set, constructed in vertical timber slabs and built around a four room square core, as shown in the plan below.

Given that Springwood Homestead is timber framed and in direct contact with the ground, it is remarkable that it is still standing and in a generally stable condition, with most roof rafters appearing to be still in place. Although the building fabric is generally intact there are a number of areas where the level of structural damage to the roof, wall and flooring members is high. The majority of the damage has occurred from termites and fungal decay, resulting in localised collapse of outer external walls and roof structures. Recently, vandalism has also been an issue, with many vertical timber slabs having been pilfered. Within the CMP developed for the site by ERM in 2015, a number of stabilisation measures have been recommended that will assist to reduce the extent of damage, however a return to a habitable state is not planned.



Springwood Homestead plan (taken from 2015 ERM CMP)



Springwood Homestead in 2012

CMP Recommendations

Although many recommendations are made within the CMP, the more important management measures have been incorporated within a conservation works schedule that covers the following issues:

- Drainage and weatherproofing;
- Vegetation;
- Termites and vermin;
- Building fabric; and
- Structural capacity and wind loads.

The works schedule prioritises the required conservation works and are presented with technical specifications from a structural engineer. Those measures that attend to the building's structural integrity are the focus of the schedule.

High Priority

a) Remove debris from roof using a cherry picker or similar;
b) Remove tree from eastern elevation and stabilize building in this location;
c) Remove vine from eastern wall using combination of pruning and herbicide;
d) Remove tree from south-west corner and stabilize building in this location;
e) Prune all overhanging branches and maintain regular maintenance program; and
f) Reinstate southern veranda and roof to match northern elevation.

Moderate to Low Priority

g) Place treated plywood sheeting over door openings;
h) Prune trees, spray weeds and slash grass;
i) Clean up of site surrounds, overseen by archaeologist;
j) Clean up of building interior, overseen by archaeologist;
k) Refix loose ceiling boards, retaining evidence of fabric if unable to fix;
l) Refix loose and dislodged slabs and plates; and
m) Place treated plywood sheeting over openings and undertake repairs to windows.

Photographic Comparison 2014 through 2024

During the inspection of Springwood Homestead for this report, a number of photographs were taken from the same angles and of the same features as were taken during the original ERM 2014 assessment that informed the CMP as well as during subsequent annual HHMP compliance inspections. These photographs provide a visual baseline condition assessment of the building, and also allow a comparative analysis of the deterioration, or maintenance, levels over the last ten years. The photographs set out below show the condition of the site today in comparison to the 2023 audit, the original 2014 assessment and other years where major changes in the site's condition were witnessed. Comments pertinent to management recommendations for the site are also provided. Where defects have been noted and/or actions have been recommended and remain outstanding, these have been presented in blue text. Where stabilisation or improvement measures have been implemented, these are noted in green text. Previous compliance audit inspection reports can be reviewed for a full photographic archive of the site.

2014	2018
	
2023	**2024**
	

Eastern elevation

2014-8: no discernible change.

2018-20 (Mar): roof slumping appears to have increased.

Mar 2020-Dec 2020: heavy leaf litter on roof persists. Positively, vegetation clearing surrounding the house is occurring regularly.

Dec 2020–2021: tree growth and associated leaf litter/structural impacts increasing.

2021-2022: tree growth increasing with associated deterioration of roof integrity.

2022-2023: tree growth continues and southern section of timber wall/skillion has collapsed.

2023-2024: tree has been pruned, fallen timbers and roof sheets have been cleared and stacked, broken edge beam strapped and propped, internal roof rafters propped

2014	2018
	
2023	**2024**
	

Southern elevation

2014-8: vertical timber slabs have been removed from southern wall.

2018-20 (Mar): possible deterioration of shingles at roof edge, and missing panels from above back door.

Mar 2020-Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: uprights from chimney room wall fallen or vandalised, along with remaining wall elements. Associated roof line slumping. Chimney slumping to the east. Movement of remnant furniture/timbers evident through doorway in western room.

2022-2023: part of door has broken off

2023-2024: some separation of left hand back wall from corner, fallen timbers and roof sheets have been cleared and stacked, edge beam propped, internal roof rafters propped, chimney has been clad and propped

2014	2020 (Mar)
	
2023	**2024**
	

Southern elevation doorway

2014-8: door has been removed.

2018-20 (Mar): no discernible change.

Mar 2020-Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: fallen timber to right of door jamb.

2022-2023: door timber fallen across hallway.

2023-2024: fallen timbers cleared and stacked

2014	2018
	
2023	**2024**
	

South-eastern corner

2014-8: vertical slabs have been removed causing further collapse of roof.

2018-20 (Mar): further deterioration of eastern wall.

Mar 2020-Dec 2020: heavy leaf litter on roof persists.

Dec 2020 – 2021: heavy leaf litter on roof persists.

2021-2022: chimney slumping and separated from ceiling; back veranda roof also slipping.

2022-2023: south-east wall and skillion roof collapsed. 3º - 4.5º lean to the east on chimney.

2023-2024: tree has been pruned, fallen timbers and roof sheets have been cleared and stacked, fallen side wall and roof propped, chimney clad and propped

2014	2018
	
2023	**2024**
	

Eastern side

2014-8: debris has been cleaned and stored and a weed removal program conducted. The house area has also been fenced.

2018-20 (Mar): further deterioration of eastern wall and regrowth of weeds.

Mar 2020-Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: apparent increased deformation of eastern roof line.

2022-2023: south-east wall and skillion roof collapsed

2023-2024: tree has been pruned, fallen timbers and roof sheets have been cleared and stacked, fallen side wall and roof propped, chimney clad and propped

2014	2022
	
2023	**2024**
	

Room 2 interior

2014-8: increased debris caused by removal of southern wall.

2018-20 (Mar): no discernible change.

Mar 2020-Dec 2020: no discernible change.

Dec 2020 – 2021: no discernible change.

2021-2022: fallen timber upright; increased decay of chimney blocks.

2022-2023: south-east wall and skillion roof collapsed, continued erosion of chimney sandstone blocks, movement of fallen timbers on floor suggests human or animal visitors.

2023-2024: floor debris cleared and stacked, fallen far roof propped and material cleared, chimney clad and propped

2014	2018
	
2023	**2024**
	

South-west corner

2014-8: shows removal of vertical slabs from southern wall.

2018-20 (Mar): no discernible change.

Mar 2020-Dec 2020: no discernible change.

Dec 2020 – 2021: furniture in far room collapsed.

2021-2022: wall/ceiling separation within white room, furniture/timber disturbance in western room.

2022-2023: no discernible change

2023-2024: separation of wall at far left corner (up to 13cm), floor debris cleared and stacked, external missing wall propped

2014	2018
	
2023	**2024**
	

Northern elevation

2014-8: further deterioration of weatherboard panelling.

2018-20 (Mar): no discernible change, though termite activity present.

Mar 2020-Dec 2020: grass/weed growth encroaching over veranda floor.

Dec 2020 – 2021: increased grass encroachment.

2021-2022: increased grass growth.

2022-2023: no discernible change

2023-2024: ground debris cleared and stacked, veranda beam propped

2014	2018
	
2023	**2024**
	

South-east corner

2014-8: shows removal of vertical slabs from southern wall, and some from eastern wall, and further collapse of roof.

2018-20 (Mar): further roof slumping and deterioration of eastern wall.

Mar 2020-Dec 2020: no discernible change.

Dec 2020 – 2021: further deterioration of eastern wall.

2021-2022: movement of roofing timbers, subsidence in chimney blocks, bottom left corner.

2022-2023: total collapse of side wall and roof

2023-2024: tree has been pruned, fallen timbers and roof sheets have been cleared and stacked, fallen side wall and roof propped, chimney clad and propped

2014	2020 (Mar)
	
2023	**2024**
	

Eastern elevation

2014-8: possible further collapse of crossbeam and guttering.

2018-20 (Mar): tree continues to impact eastern roof line.

Mar 2020-Dec 2020: increased impact on roofline by tree branches.

Dec 2020 – 2021: tree continues to impact eastern side.

2021-2022: veranda roof now considerably buckled in middle, with separation of timber members occurring.

2022-2023: tree continues to impact eastern side, with wall collapse shown at near left.

2023-2024: tree has been pruned, broken edge beam strapped and propped

2014	2020 (Dec)
	
2023	**2024**
	

Northern elevation

2014-8: slumping of veranda along edge beam.

2018-20 (Mar): no discernible change.

Mar 2020-Dec 2020: grass/weed growth encroaching over veranda floor.

Dec 2020 – 2021: no discernible change.

2021-2022: peppercorn has been pruned; termite damage is increased within veranda uprights.

2022-2023: increased splitting to fourth veranda post from right

2023-2024: deterioration of third veranda post from right, props installed at centre of veranda and near corner, floor debris cleared and stacked

2014	2022
	
2023	**2024**
	

View of south-west corner from south

2014-8: shows removal of vertical slabs from southern wall as well as some increase in vegetation growth.

2018-20 (Mar): no discernible change but continuing vegetation impacts.

Mar 2020-Dec 2020: apparent increased vine growth.

Dec 2020 – 2021: continued impacts on south-west corner.

2021-2022: vine has been chopped near ground and killed, some resultant movement of timbers.

2022-2023: no discernible change but continuing vegetation impacts.

2023-2024: bowing of western wall, clean up of fallen timbers

The comparative photographs above show the changes at the building over the past ten years. Over the last year there have been several positive changes implemented across the site to help stabilise the building and protect vulnerable items of historic fabric, with actions such as the propping and stabilisation informed by the recent condition inspection (Bill Jordan and Associates, 23 April). These measures include:

- Pruning of the tree impacting the eastern elevation
- Clearing and stacking of all historic items of building fabric that have previously collapsed, fallen or have otherwise been arrayed across the site
- Strapping and propping of eastern edge beam as well as propping of internal roofing rafters along this section
- Propping of southern elevation edge beam
- Cladding and propping of sandstone chimney
- Northern veranda edge beam propped



Examples of structural propping along the eastern elevation

These are positive management measures that will serve to stabilise the building in anticipation of further remedial structural actions being implemented. Some detrimental changes were also noted, the most significant being some separation (of up to 13cm) at the northern corner of Room 3 along the wall with Room 5, with the fall towards the west.

Despite the positive management measures implemented, it can also be expected that the underlying causes of deterioration, such as the degeneration of wooden framework, impacts caused by adjacent trees and the effects of weather entering the unsealed building has continued. Therefore, the priority CMP actions originally identified remain of importance, with recognition that work has begun in this regard.

It remains noted that the collapse of the south-eastern section of wall identified during the 2023 audit exposed some portions of old newspaper that had been adhered to one pieces of

wood that once served as shelving in this room. These newspaper fragments are 115 years old and recommendations on their care and conservation are outlined below.

Recommendations

Management recommendations have been prioritised as high or moderate importance, with high priority recommendations to be actioned as soon as possible. It is acknowledged that the initial high priority recommendation arising from the 2023 HHMP Compliance Inspection Audit Report has been implemented, with conservation works schedule within the CMP having been re-assessed by Bill Jordan and Associates, and deemed adequate and fit for purpose in light of the building's current structural status. The propping measures recently applied are acknowledged as a positive step towards stabilising the building's decline.

High Priority

1. Remove the trees and vines currently impacting the building at the eastern elevation and south-west corner and treat to prevent regrowth (acknowledgment that work has begun in this regard). Coincident with this removal, acrow props should be installed where appropriate, i.e. where the trees themselves have been supporting the building structure, and as per current structural engineer's instructions at Annex B of the CMP;
2. Once vegetation has been removed, clean all debris from the roof and prune (or consider the removal of) all other trees in close vicinity of the building with potential to drop leaf/branch litter on roof;
3. Engage an archaeologist to ensure any items of historical relevance recently cleared and stored within the building are salvaged and dealt with appropriately; and
4. The wooden piece containing the remnant newspaper fragments should be removed from the site as soon as possible in order to preserve the remaining fabric. The piece should be stored inside and in constant temperature conditions at low humidity and in dark conditions. It should be stored so as to be protected from vermin and pests, and personnel involved should avoid touching the fragments, especially with bare hands. Prior to removal, in situ photographs should be taken of the piece and its relationship to the other fallen timbers in order to record its contextual provenance. These measures should be undertaken immediately and do not require the structural engineering report in order to commence.

Moderate Priority

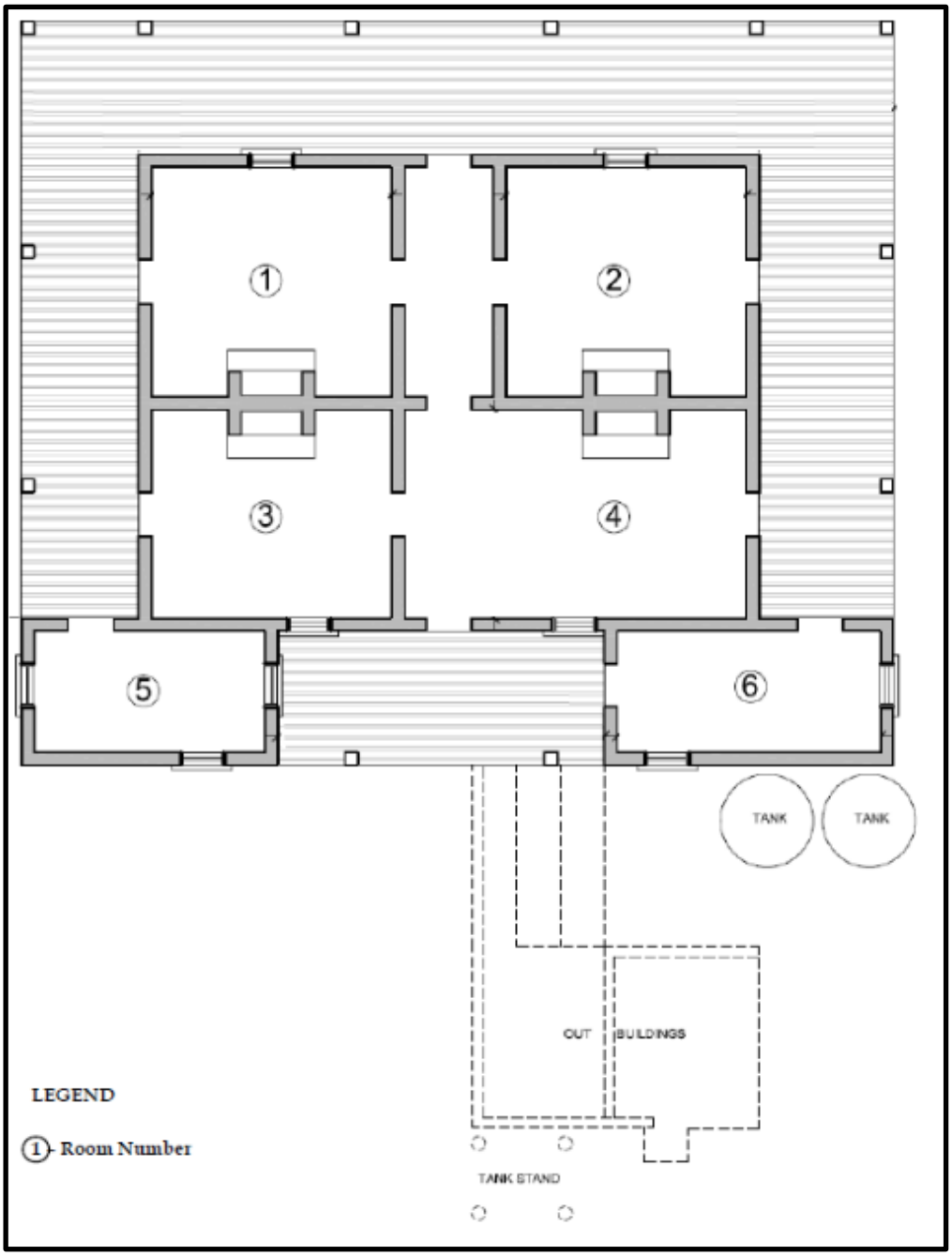
Once the high priority recommendations have been attended to, the structural engineer may recommend different or additional measures than originally put forward. Pending this report,

the following moderate priority measures are recommended to attain compliance with the CMP and enhance the condition of the homestead:

1. Due to their propensity to harbour termites and transfer infestation to the building, remove all peppercorn trees from around the building, a process which has begun;
2. Maintain the regular vegetation maintenance program;
3. Pending structural engineer's advice, reinstate western, eastern and southern walls, veranda and roof to match northern elevation.
4. Pending reconstruction of southern wall, place treated plywood sheeting over door and window openings;
5. Detailed clean up of building interior, overseen by archaeologist;
6. Pending structural engineer's advice, refix loose ceiling boards and loose and dislodged wall slabs and plates, retaining evidence of fabric if unable to fix;
7. Ensure the minor recommendations and 'policies' listed throughout Section 7 of the CMP are considered in the future management of the homestead;
8. Give consideration to an archaeological excavation and research program at the site, with possible community involvement, to explore the areas of archaeological potential identified in the CMP; and
9. Maintain the termite and pest control regime at the building.

Mount Thorley Brick Farm House

The Mount Thorley Brick Farm House is located off the Golden Highway opposite the MTW coal handling and preparation plant, c.10km south-west of Singleton. The portion of land on which the house sits was purchased by Eliza Glass in 1870 and the physical attributes of the house, which display characteristics of Victorian Georgian architecture, suggest that it was constructed during the following decade. The building is roughly square in plan, with four principal rooms flanking a central hallway.



Floor plan of Mount Thorley Brick Farm House, north up (from ERM 2015 CMP)



Mount Thorley Brick Farm House (2012)

The masonry structure of the building is sound, however, it was noted as being in poor physical condition in 2015 (when a CMP was developed for the site by ERM), with a collapsed veranda roof, missing or loose roof sheeting, missing or collapsed veranda posts, and floorboards and areas affected by termites. The conservation works schedule within the CMP considered the following issues at Mount Thorley Brick Farm House:

- Drainage and weather-proofing;
- Asbestos;
- Vegetation;
- Termites and vermin;
- Building fabric; and
- Structural capacity and wind loads.

Recommendations were made within the CMP's conservation works schedule to address the elements above, a number of which have completed by the proponent. These works included:

- Removal and safe storage of veranda;
- Initial vegetation clearing;
- Sheeting and sealing of all window and door openings;
- Clean up of scattered debris surrounding building; and

- Repair of loose roof sheeting and patching of holes.

Monitoring and maintenance of these repaired items is an ongoing requirement to ensure they provide continual protection to the building.

Photographic Comparison 2015 through 2024

During the inspection of the Mount Thorley Brick Farm House for this report, a number of photographs were taken from the same angles and of the same features as were taken during the original ERM 2015 assessment that informed the CMP as well as during subsequent annual HHMP compliance inspections. These photographs provide a visual baseline condition assessment of the building, and also allow a comparative analysis of the deterioration, or maintenance, levels over the last nine years. The photographs set out below show the condition of the site today in comparison to the 2023 audit, the original 2015 assessment and other years where major changes in the site's condition were witnessed. Comments pertinent to management recommendations for the site are also provided. Where defects have been noted and/or actions have been recommended and remain outstanding, these have been presented in blue text. Where stabilisation or improvement measures have been implemented, these are noted in green text. Previous compliance audit inspection reports can be reviewed for a full photographic archive of the site.

2015	2018
	
2023	**2024**
	

View of north-west side

2015-8: veranda removed and stored inside building, vegetation has been managed.

2018-20 (Mar): vegetation has regrown around building**.**

Mar 2020-Dec 2020: vegetation again under control, panel above boarded door requires refixing.

Dec 2020 – 2021: vegetation requires management and loose boards re-affixing.

2021-2022: panelling fixed or reinstalled on all openings; ruinous electricity board fallen; increased vandal activity at left-most door opening; grass recently mowed.

2022-2023: recently mowed and left door barricading bolstered. Guttering deterioration and lifting of roof tin at near corner.

2023-2024: Damaged leftmost door opening repaired, guttering deterioration and lifting of roof tin at near corner

2015	2020 (Dec)
	
2023	**2024**
	

View of north-west roof corner (focus on damaged roof)

2015-8: roofing sheets have been replaced and holes patched.

2018-20 (Mar): some minor roof holes and lifted sheeting noted.

Mar 2020-Dec 2020: some veranda flashing fallen, panel above door requires refixing.

Dec 2020 – 2021: panel above door requires re-affixing and guttering remains in disrepair.

2021-2022: panel above door fixed, guttering in disrepair.

2022-2023: Deterioration of guttering and roof edge.

2023-2024: Deterioration of guttering and roof edge.

2015	2018
	
2023	**2024**
	

View of door and window panelling

2015-8: sheeting installed on all openings, however some repair required.

2018-20 (Mar): no discernible change.

Mar 2020-Dec 2020: Front door panel requires reinstallation.

Dec 2020 – 2021: front door panel remains broken.

2021-2022: front door panel reaffixed; veranda grass poisoned.

2022-2023: new panelling installed on front door.

2023-2024: no discernible change

2018	2022
	
2023	**2024**
	

View of door and window panelling

2015-8: sheeting installed on all openings, however some repair required.

2018-20 (Mar): some repair of panelling required.

Mar 2020-Dec 2020: Broken panel remains unrepaired.

Dec 2020 – 2021: broken panel remains unrepaired.

2021-2022: door panel fixed; uprights fixed and propped to support roof.

2022-2023: weeds sprayed, however water appears to be settling under back veranda, which may require attention.

2023-2024: no discernible change

2015	2018
	
2023	**2024**
	

View of rear of building (view south)

2015-8: debris has been cleared and stacked.

2018-20 (Mar): vegetation has regrown around building and stacked debris.

Mar 2020-Dec 2020: vegetation cleared and debris restacked.

Dec 2020 – 2021: vegetation management required.

2021-2022: vegetation managed; collapsed roofing members tidied and stacked inside building; broken fascia removed but not repaired.

2022-2023: no discernible change.

2023-2024: no discernible change

2018	2020 (Dec)
	
2023	**2024**
	

View of rear of building (view north)

2015-8: debris has been cleared and stacked.

2018-20 (Mar): vegetation has regrown around building and stacked debris.

Mar 2020-Dec 2020: vegetation cleared and debris restacked.

Dec 2020 – 2021: vegetation regrown.

2021-2022: rear of building has been tidied and vegetation managed; building openings repanelled.

2022-2023: guttering has fallen with lifting of roof sheeting behind.

2023-2024: broken guttering has fallen to ground

2015	2018
	
2023	**2024**
	

View of eastern veranda (focus on veranda floor)

2015-8: posts and sheeting removed, damaged boards remain exposed.

2018-20 (Mar): damaged boards remain and vegetation growth throughout.

Mar 2020-Dec 2020: damaged boards remain and vegetation growth throughout.

Dec 2020 – 2021: veranda floor remains dilapidated and grass growth throughout.

2021-2022: door panel fixed, vegetation managed but veranda floor remains dilapidated.

2022-2023: no discernible change.

2023-2024: no discernible change

2015	2020 (Dec)
	
2023	**2024**
	

View of rear of building (focus on roof)

2015-8: skillion roof, guttering and rafters have collapsed; main roof holes repaired.

2018-20 (Mar): no discernible change.

Mar 2020-Dec 2020: some minor holes in roofing require repair.

Dec 2020 – 2021: minor roofing holes remain.

2021-2022: veranda uprights propped, loose members tidied; roofing appears patched.

2022-2023: shows fallen guttering with lifting of roof sheeting behind.

2023-2024: no discernible change

2015	2020 (Dec)
	
2023	**2024**
	

View of north-east of building

2015-8: wall element has collapsed (bricks stacked under window); roof framing, sheeting and guttering has collapsed.

2018-20 (Mar): no discernible change.

Mar 2020-Dec 2020: no discernible change.

Dec 2020 – 2021: rafter collapse from above window.

2021-2022: redundant electrical box fallen; increased vandal activity at doorway; roof capping repaired; redundant panel can be removed.

2022-2023: window opening cover replaced and door panel repaired.

2023-2024: graffiti on new door panel, fallen upper lintel plaster

2015	2020 (Dec)
	
2023	**2024**
	

View of north-east corner of building (focus wall below window)

2015-8: bricks from roof above stacked in front of required repointing, window sheeting removed.

2018-20 (Mar): no discernible change.

Mar 2020-Dec 2020: repointing requirements remain.

Dec 2020 – 2021: repointing requirements remain.

2021-2022: collapsed roofing members stacked inside; far door panel reaffixed; redundant panel can be removed; repointing requirements remain.

2022-2023: window panel replaced, repointing requirements remain

2023-2024: repointing requirements remain, fallen lintel plaster and bricks

2015	2021
	
2023	**2024**
	

View of south-east of building (focus on top of wall)

2015-8: repointing requirements remain.

2018-20 (Mar): repointing requirements remain.

Mar 2020-Dec 2020: repointing requirements remain.

Dec 2020 – 2021: repointing requirements remain.

2021-2022: repointing and fascia repair requirements remain; white paint or similar has been daubed on wall.

2022-2023: brick fallen from chimney, some bowing to top of wall at veranda's end, repointing and fascia repair requirements remain.

2023-2024: brick fallen from chimney, bowing to top of wall at veranda's end with brick missing also, repointing and fascia repair requirements remain.

2015	2020 (Dec)
	
2023	**2024**
	

View of eastern veranda (focus on dwarf wall wall)

2015-8: debris cleared from veranda, no change to dwarf wall.

2018-20 (Mar): no discernible change.

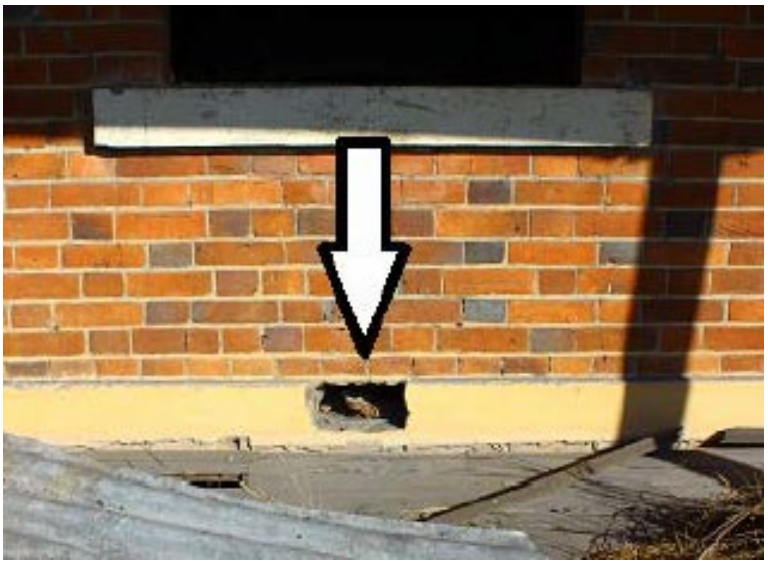
Mar 2020-Dec 2020: cracking to wall evident.

Dec 2020 – 2021: remains in disrepair.

2021-2022: vegetation managed but remains in disrepair.

2022-2023: vegetation managed but remains in disrepair.

2023-2024: remains in disrepair

2015	2018
	
2023	**2024**
	

View of ventilation grilles

2015-8: grilles not replaced.

2018-20 (Mar): grilles remain missing.

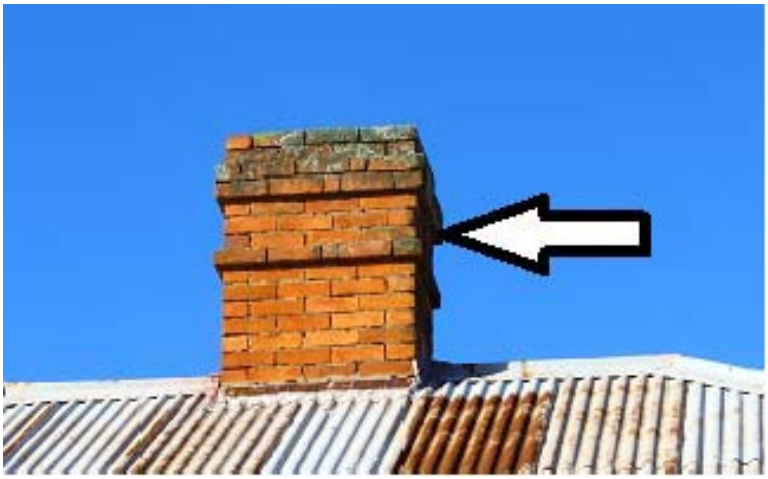
Mar 2020-Dec 2020: grilles remain missing.

Dec 2020 – 2021: grilles remain missing.

2021-2022: grilles remain missing.

2022-2023: grilles remain missing.

2023-2024: grilles remain missing.

2015	2020 (Mar)
	
2023	**2024**
	

View of southern chimney

2015-8: repointing requirements remain.

2018-20 (Mar): repointing requirements remain.

Mar 2020-Dec 2020: repointing requirements remain.

Dec 2020 – 2021: repointing requirements remain.

2021-2022: repointing requirements remain.

2022-2023: brick missing and repointing requirements remain.

2023-2024: brick missing and repointing requirements remain.

The comparative photographs above show the changes at the building over the past nine years. Some minor repairs to door opening panels have occurred between the current and the last inspection, with vegetation levels being well managed also. Although these ongoing maintenance measures are beneficial, some priority actions identified within the CMP and during previous inspections remain of importance and, if anything, their need of remediation has increased in urgency. The key issues are currently:

- Considerable damage and exposure to the rear of the building;
- Veranda boards in need of repair;
- Holes in sections of fascia;
- Gutters remaining in a state of disrepair; and
- Brickwork repointing requirements at a number of locations

It should be noted that the termite and vegetation management regimes have been implemented around the site, as have numerous smaller repairs, including propping, which are positive actions and will assist in the arrest of the deterioration of the building. If recommended by a termite control specialist, nearby peppercorns should be removed due to their propensity to harbour termites. The lemon tree to the west of the building should be retained due to its connection with habitation of the house.

Recommendations

While many of the high and moderate priority recommended actions within the CMP conservation works schedule have been completed in the past, the recommendations outlined below are required as part of the ongoing maintenance of the building and to minimise the risk of further deterioration in the building structure.

High Priority

1. If any asbestos or fibrous cement sheeting remains at the property, engage an asbestos removalist to remove as required;

Moderate Priority

2. Check that all debris surrounding the house has been removed. If this has not occurred, remove all debris, ensuring an archaeologist is on hand to identify and catalogue any early architectural fittings or rare pieces of joinery that should be retained for future restoration purposes;
3. Reinstall veranda, including veranda decking and northern brick dwarf wall, re-using original material where possible, as per recommendations M5, M6 and L1 in the CMP conservation works schedule;

4. As the roof above Room 6 has collapsed, salvage any reusable masonry or timber and set aside within room. Engage a structural engineer to advise on feasibility of reconstructing the roof. (NB. Recommendation M9 in the CMP conservation works schedule erroneously refers to this room as Room 5 rather than Room 6 as shown in the floor plan);
5. Repair fascias and replace gutters around the house to match existing materials and ogee profile. Install new down-pipes and ensure they are discharging away from the building – particularly away from eastern back veranda;
6. Repoint mortar joints with lime-based mortar on brickwork below Room 6 eastern elevation window sill, on northern and western walls of room 5 and all chimneys;
7. Install new ventilation grilles to existing ground level openings; and
8. Maintain the vegetation management and termite and pest control regimes at the building.

Conclusion

Up to twelve years has now elapsed since the preparation of the CMPs began for the three historic heritage buildings reviewed during this inspection. Although some important conservation measures have been implemented over the last decade, other recommended management actions remain incomplete, with the urgency surrounding their attention only increasing year on year. The following actions are considered imperative to prevent irreparable damage to the buildings and, once complete, will provide a solid foundation from which to tackle the remaining issues.

Former RAAF Base Bulga Mess Hall

- Engage an asbestos expert to assess and develop a clean-up and disposal plan to deal with both the broken fragments and intact asbestos sheeting;
- Remove any remaining tree branches from the roof. In addition, to prevent similar damage in the future, serious consideration should be given to removing or lopping those trees that are located close enough to the building that they may cause damage if they fall or drop large branches;
- Pending the results of the asbestos assessment, the building and surrounds should be thoroughly cleaned of asbestos and other rubbish material. An archaeologist should be present to collect any items of historic importance or that relate to the original fabric of the building. This should also include the removal, repair and curation of items such as window frames and panels before their total deterioration. All such items can be stored inside the building and potentially re-used during further stabilization programs;
- Pending the results of the asbestos assessment, susceptible parts of the building framework, such as roofing members and walls should be stabilized and propped, using the CMP Bligh Tanner plans as a guide; and
- A structural engineer should then inspect the building before any further works are commenced to make further recommendations on stability requirements and structural repairs. These further works should aim to reduce the likelihood and extent of any further deterioration at the site rather than seek to rebuild or renovate as it is unlikely that there would be any valid or appropriate option to re-use the site.

Springwood Homestead

- Remove the trees and vines currently impacting the building at the eastern elevation and south-west corner and treat to prevent regrowth (acknowledgment that work has begun in this regard). Coincident with this removal, acrow props should be installed

where appropriate, i.e. where the trees themselves have been supporting the building structure, and as per current structural engineer's instructions at Annex B of the CMP;

- Once vegetation has been removed, clean all debris from the roof and prune (or consider the removal of) all other trees in close vicinity of the building with potential to drop leaf/branch litter on roof;
- Engage an archaeologist to ensure any items of historical relevance recently cleared and stored within the building are salvaged and dealt with appropriately; and
- The wooden piece containing the remnant newspaper fragments should be removed from the site as soon as possible in order to preserve the remaining fabric. The piece should be stored inside and in constant temperature conditions at low humidity and in dark conditions. It should be stored so as to be protected from vermin and pests, and personnel involved should avoid touching the fragments, especially with bare hands. Prior to removal, in situ photographs should be taken of the piece and its relationship to the other fallen timbers in order to record its contextual provenance. These measures should be undertaken immediately and do not require the structural engineering report in order to commence.

Mount Thorley Brick Farm House

- If any asbestos or fibrous cement sheeting remains at the property, engage an asbestos removalist to remove as required.

Appendix 5:

Annual Stream Health and Stability Report

MOUNT THORLEY WARKWORTH

ANNUAL STREAM HEALTH AND CHANNEL STABILITY MONITORING REPORT 2024



Looking downstream in Wollombi Brook site BM37

DATA REPORT PREPARED FOR MOUNT THORLEY WARKWORTH PTY LTD

MARINE POLLUTION RESEARCH PTY LTD
FEBRUARY 2024

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1 INTRODUCTION

Marine Pollution Research (MPR) has been commissioned by Mount Thorley Warkworth (MTW) to undertake stream health and channel stability monitoring of creekline drainages downstream of the MTW discharge point and adjacent the MTW open cut mining operations in the upper Hunter Valley, NSW, to meet the requirements outlined in Section 7.4 of the approved Water Management Plan (WMP) (Version 5.1, October 2021). This data report provides the results of the Annual Stream Health and Channel Stability monitoring undertaken by MPR in November to December 2024, with former survey reports provided by SLR between 2017 and 2022 and MPR in 2023 (see **Section 5**).

2 MONITORING PROGRAM METHODOLOGY

The objective of the MTW Channel Stability and Stream Health Monitoring program is to monitor the channel stability and health of the riparian vegetation in the waterways downstream of the MTW discharge point and adjacent to the mine footprint, to ensure they are not affected by the existing approved MTW mine operations. Excess mine water contained in Dam 9s is released via the MTW discharge point in the upper limits of Loder Creek, an activity which is regulated under the Hunter River Salinity Trading Scheme (HRSTS). In accordance with the monitoring requirements outlined in the MTW WMP, annual Channel Stability and Stream Health monitoring is undertaken in Loder Creek and Wollombi Brook (see **Figure 1** and **Table 1** below).

Table 1 MTW Channel Stability and Stream Health Monitoring Site Program 2024

Creek	Site	E	N	Transect	Photos	RARC	CSIRO
Nine Mile Ck	MTW LDP2	322016	6385376	x	x	x	x
Loders Creek	BM35	322746	6385819	x	x	x	x
Loders Creek	BM34	323779	6388119	x	x	x	x
Wollombi Brook	BM37	313709	6388933		x	x	x
Loder Creek	LC1	321974	6385382		x		x
Loder Creek	LC2	322019	6385367		x		x
Loder Creek	LC3	322087	6385446		x		x
Loder Creek	LC4	322367	6385647		x		x
Loder Creek	LC5	322484	6385655		x		x
Loder Creek	LC6	322670	6385697		x		x
Loder Creek	LC7	322759	6385778		x		x
Loder Creek	LC8	323948	6389351		x		x
Loder Creek	LC9	323996	6389540		x		x
Loder Creek	LC10	324131	6390142		x		x
Loder Creek	LC11	322881	6386043		x		x
Loder Creek	LC12	323802	6388650		x		x
Loder Creek	LC13	324160	6390408		x		x
Loder Creek	LC14	323800	6389222		x		x
Loder Creek	LC15	324150	6390239		x		x
Loder Creek	LC16	324329	6390543		x		x

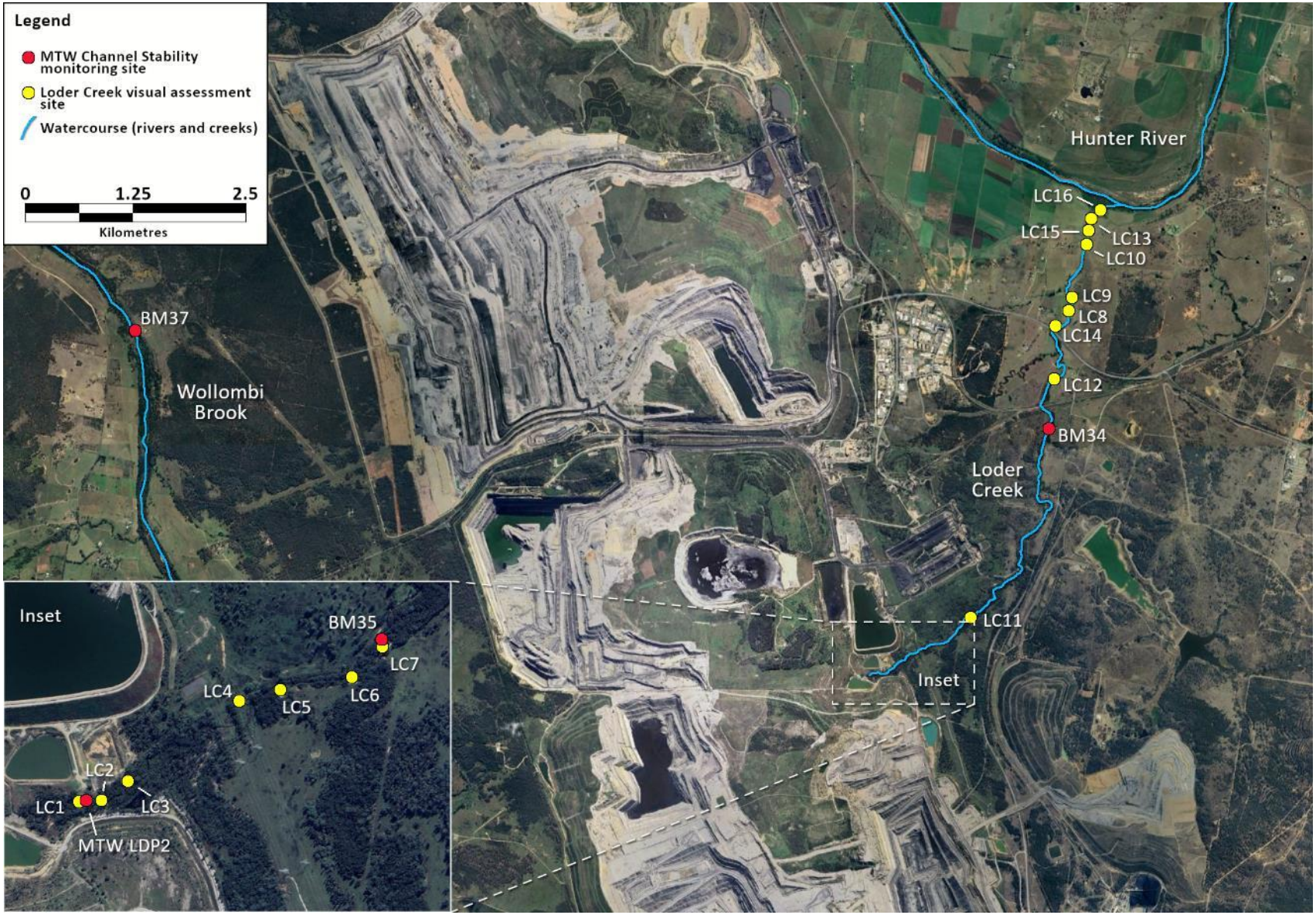


Figure 1: MTW 2024 Channel Stability Monitoring Sites

Assessment of geomorphic condition in stream health assessment is undertaken using a subjective, rapid, visual assessment methodology, with the trajectory of change assessed by comparing scores from surveys made over time. The MTW Channel Stability and Stream Health monitoring program includes the following features:

- Channel Stability rating using the CSIRO *Ephemeral Stream Assessment* (CSIRO ESA) guidelines protocol to assess the erosional state of the creek channel banks and bed,
- Stream Health rating using the Land & Water Australia Rapid Appraisal of Riparian Condition protocol (RARC), to assess the ecological condition of riparian habitats using indicators that reflect functional aspects of the physical, community and landscape features of the riparian zone,
- Cross sectional channel depth transect measurements for a comparative assessment of channel shape over time,
- Photographic monitoring points to facilitate a comparative assessment of channel stability over time,
- Documenting locations and dimensions of significant erosive or depositional features from which any subsequent changes can be evaluated.

2.1 CSIRO Ephemeral Stream Assessment

The CSIRO Ephemeral Stream Assessment method (Tongway and Ludwig 2011) was used to evaluate the condition of drainage channel features in Nine Mile Creek, Loder Creek and Wollombi Brook. There are four main classes of indicators assessed:

A. The type and condition of the vegetation present, if any,
B. The shape and profile of the drainage line and type and condition of materials on the drainage line floor.
C. The nature of the drainage line wall materials.
D. The nature of the stream bank bordering flats and/or slopes and regulation of lateral flow into drainage line.

The indicators produce an activity rating which, when converted to a percentage, ranks each location from *Very Active* through to *Very Stable* (**Table 2**). Annual monitoring results are reviewed and compared with previous surveys to assess whether stream channel degradation has occurred as a result of mine operations.

An investigation is triggered when there is a decrease in the CSIRO ESA classification over two consecutive monitoring rounds at any of the four prescribed monitoring sites (see **Table 9.3** from the MTW WMP), and **Section 9.2** of the MTW WMP outlines the response procedure in the event of a performance trigger breach.

Table 2 CSIRO ESA Activity Ratings & Classifications		
Activity Rating (%)	**Classification**	**Classification definitions**
80 +	Very Stable	Drainage line is very stable and likely to be in original form. It is able to withstand all flow velocities that have previously occurred in this area and only minimal monitoring is required, predominantly after high flow events, to ensure condition does not deteriorate.
70-80	Stable	Drainage line is stable. It is important to assess this zone in relation to the other classifications and define whether this zone is moving from potentially stabilising to a more stable form, or if it is deteriorating from a very stable form. The nature of this relationship will identify the type of monitoring required.
60-69	Potentially Stabilising	Drainage line is potentially stabilising. Ongoing monitoring is required while rehabilitation works are not needed in the immediate future.
50-59	Active	Drainage line is actively eroding and remedial actions are required. It is important to classify if erosion is caused primarily by upstream flows, lateral flows or unstable wall materials so that appropriate rehabilitation can be carried out.

2.2 Rapid Appraisal of Riparian Condition (RARC)

The Rapid Appraisal of Riparian Condition assesses the ecological condition of riparian habitats using indicators that reflect functional aspects of the physical, community and landscape features of the riparian zone (Jansen et al 2005). The RARC method includes score ratings for the following categories:

- Longitudinal continuity and width of riparian canopy vegetation and proximity to nearest patch of native vegetation,
- Vegetation cover for canopy, understorey and ground layers,
- Vegetation cover for canopy, understorey and ground layers for natives,
- Cover of standing dead trees, leaf litter, and fallen logs, and
- Presence of native vegetation regeneration, native tussock, grasses and reeds.

The scores for these five categories are tallied to provide an overall score indicating riparian health:

Table 3 RARC Classification Ratings	
RARC Score	**RARC Classification**
<25	Very Poor
25 - 30	Poor
30 - 35	Average
35 - 40	Good
>40	Excellent

Annual monitoring results are reviewed and compared with previous surveys to assess whether stream channel degradation has occurred as a result of mine operations. An investigation is triggered when there is a decrease in the RARC Stream Health Assessment classification over two consecutive monitoring rounds at any of the four prescribed monitoring sites (see **Table 9.3** from the MTW WMP), and **Section 9.2** of the MTW WMP outlines the response procedure in the event of a performance trigger breach.

2.3 Channel Profile Measurements

Stream channel depth profiles are undertaken along a fixed transect to assess temporal changes to the channel shape by fluvial processes (i.e., bank erosion or sediment deposition). Former Channel Stability and Stream Health monitoring surveys have recorded depth transect measurements by extending a tape between two fixed survey pegs, whereby a survey staff was then used to measure the vertical distance between the tape and the ground surface at approximately 0.5m increments or at points which captured any sudden changes in channel geometry (SLR 2022). It is also noted that the previous SLR results are relative to the survey peg height and not fixed to an AHD height as generally recommended.

Whilst this method is for the most part repeatable, it does not take into account tape slack, which accounts for around 150mm drop in the centre of the tape over a 15m profile. Taking this into consideration, MPR measured the creek channel profile using a dumpy level where the site channel depth measurements were recorded at 0.5m intervals relative to the fixed peg on the left-hand bank (looking downstream), and at significant channel structures or irregular forms (such as incised channel banks, steep sections, rocky outcrops), finishing at the right-hand bank peg.

The 2024 dumpy Channel Transect Profile results are shown in **Appendix Figures A-1** to **A-3** and include any water level measurements encountered during the 2024 survey (represented as blue lines).

2.4 Site Channel Visual Assessment

Additionally, visual assessments were undertaken throughout all study sites which included documenting the locations of any significant erosion or depositional sedimentary features and photographing monitoring points at representative locations. Annual monitoring results will be compared with previous monitoring events with the overall aim of detecting temporal changes in drainage channel condition.

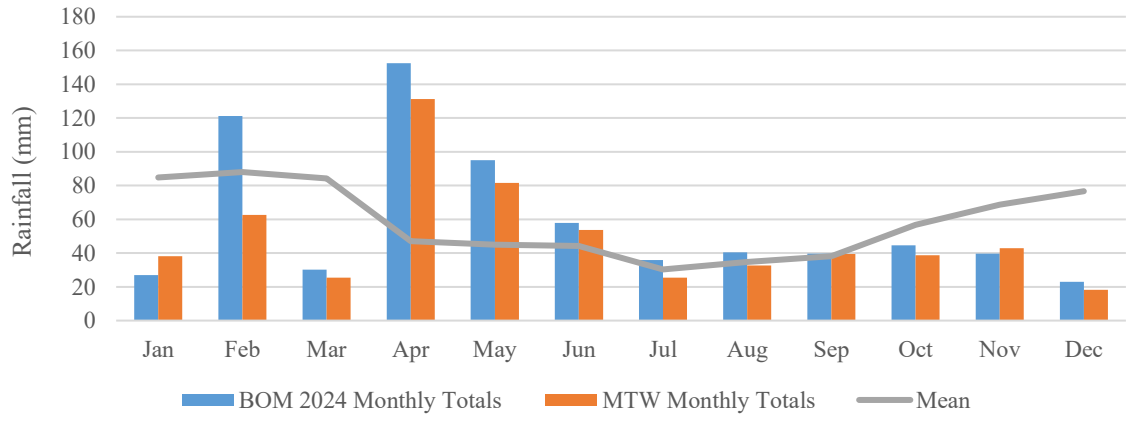
3 MTW CHANNEL STABILITY & STREAM HEALTH RESULTS

The MTW Channel Stability and Stream Health monitoring survey was undertaken between the 26th November and 4th of December 2024. **Section 3.1** below summarises the study area weather conditions recorded over the year to date, **Section 3.2** provides the Stream Health and Channel Stability site results and **Section 3.3** provides the Loder Creek Site Visual Assessment results. Channel transect cross sections are provided in **Appendix Figures A-1** to **A-3**, full RARC data sheets are in **Appendix B** and CSIRO ESA data sheets are in **Appendix Table C**.

3.1 Weather Leading Up to the Annual Survey

Rainfall records are recorded at Bureau of Meteorology (BOM) Bulga Down Town gauge (61143) located near BM37 and MTW mine site at Charlton Ridge. The 2024 monthly gauge totals are compared to the long-term mean monthly rainfall totals acquired FROM BOM Bulga Down Town gauge since 1961, shown in **Figure 2** below.

Figure 2 Combined Gauge Rainfall 2024



Monthly rainfall patterns over 2023 followed similar patterns to the mean monthly totals, however, the cooler months which are historically the driest, produced only 40% (99mm) of the combined mean total over the 6 months between May and October at Bulga Down town rain gauge. Rainfall was highly variable in early 2024 with generally wet conditions occurring in February and between April and June as isolated, moderate to heavy shower events, and this was followed by a trend of declining rainfall over the latter months leading into the 2024 Stream Health Channel Stability Monitoring survey in late November:

- The first half of 2024 saw highly variable rainfall, with April (152mm) being the wettest month (as measured at the Bulga Down town rain gauge), and January

(27mm) the driest, however there were some discrepancies for February between the MTW rainfall gauge (63mm) and BOM gauge (121mm), indicating that showers were highly localised.

- Rainfall recorded at the BOM gauge was 3.2 times its long-term monthly mean for April, and included a rainfall event on the 5th and 6th where 116mm fell over a 48-hour period.
- Rainfall stabilised in the middle of the year, aligning closely between the BOM and MTW gauges with long-term monthly averages from July through to October (ranging between 36 and 45mm), falling mostly as brief, light to moderate shower events.
- The month leading into the 2024 survey period was generally dry with only 36mm rain.

3.2 Channel Stability & Stream Health Site Monitoring Results 2024

3.2.1 Loder Creek site MTW LDP2

Site: MTW LDP2			
Coordinates (MGA56):		E	N
		322016	6385376
Method	Year	Score	Rating
RARC	2023	N/A	N/A
	2024	32	Average
CSIRO	2023	N/A	N/A
	2024	69	Potentially Stabilising

Following the adoption of recommendations made in MPR (2024), the Stream Health and Channel Stability site downstream of Mount Thorley Warkworth mine Licensed Discharge Point (LDP) was moved from its former location among the boulder lined channel adjacent to the LDP, to a short distance downstream in a section of natural channel.

New site MTW LDP2 is located in the upper reaches of Loder creek, contained within a narrow section of drainage channel with mostly shallow sloped banks and a localised incision of the channel basin (**Figures 3** and **4**). There was minimal surface water present with only one shallow pool observed (1.5m long and 0.1m deep), and there was no surface flow through the site. The small introduced pest fish species plague minnow (*Gambusia holbrooki*) were observed in the surface pooling, and a native water skink (*Eulamprus sp*) was observed adjacent to the water.

The riparian corridor consisted of a continuous band of the swamp-oak (*Casuarina glauca*), with scattered eucalypts, with swamp-oak density being slightly higher on the southern bank. The understory was generally sparse, comprising scattered swamp-oak saplings and patchy couch (*Cynodon dactylon*) grasses minimal weed or shrub presence. The dominant swamp-oak canopy supports a dense and continuous layer of swamp-oak detritus (needles and woody debris), smothering couch grasses in some areas. The thickness of detrital layering was dependant on the canopy density, seeing greater thickness on the southern banks, with partially exposed soils on the northern bank. The channel basin was supported moderately dense aggregations of the invasive spiny rush (*Juncus acutus*), with no other macrophytes present. Spiny rush density was slightly lower than that observed upstream at LC1.

There are minor erosional features of concern capable of contributing to the sediment load within the channel basin. A large eucalypt tree occupies the northern bank with undercutting present around the tree trunk and root masses, and this is a potential source of sediment loss considering this section of the bank is generally steep. All areas of undercutting around tree roots are smothered in a thick swamp-oak detrital layering. There was some localised evidence of channel bed erosion occurring around existing spiny rush stands with pooled water (**Figure 3**). The exposed soils on the northern bank are another potential erosion risk, although the moderately sloped banks limit the impact of sediment input along this bank, and the channel sediment composition consisted of sandy gravels and pebbles with some clays.

The MTW LDP2 CSIRO ESA returned a rating of *Potentially Stabilising* and the RARC was classified as and *Average* for the 2024 survey.



Figure 3: Looking upstream (left) and downstream (right) at Loder Creek site MTW LDP2.



Figure 4: Site MTW LDP2 left bank (left) and right bank (right).

3.2.2 Loder Creek site BM35

Site: BM35		4/12/24	
Coordinates (MGA56):		E	N
		322746	6385819
Method	Year	Score	Rating
RARC	2023	32	Average
	2024	34	Average
CSIRO	2023	59	Active
	2024	59	Active

Site BM35 is located just downstream of the confluence of Loder Creek and Nine Mile Creek. The channel shape is V-shaped with shallow sloping banks, supporting a shallow (0.3m to 1m deep) and meandering box shaped stream flow channel in the middle. Small, scattered pools of water were present at the time of survey with no evidence of any surface flow.

The BM35 swamp-oak riparian corridor did not exhibit any major changes in extent or density, likely owing to reduced rainfall quantities observed over the months leading into the 2024 survey, and the riparian corridor is considered as being in a stable condition. Couch grass ground cover vegetation remains restricted to the channel bottom and base of the channel walls, which along with the swamp-oak needle layer, dominated the groundcover at BM35 (**Figure 5**), and the sites drainage walls were also covered by a continuous layer of swamp-oak needles. There were no changes in the extent of macrophytes at the location (spiny rush and the common reed (*Phragmites australis*)), with densities very similar to that encountered in 2023.

Additionally, the composition and extent of weed species were unchanged, except for some minor increases of existing lantana (*Lantana camara*), with curled dock (*Rumex crispus*), purple top (*Verbena bonariensis*) present in similar abundance to recent surveys.

The was some minor growth noted for couch grasses at the foot of the channel walls where colluvial sediments have settled, with a slight increase in coverage in 2024 (**Figure 6**). The exposed upper southern (right hand) bank (**Figure 7**) remains a major source of active erosion, supplemented by animal tracks crosscutting the site sees both sources contributing to the fine sediment input to the creek line.

Measurements across most sampled parameters for RARC showed small scale changes. There was a marginal increase in the score for 'Natives', attributed to a growth in shrubbery, with native understory present in 3 of the 4 transects. In addition, generalised growth of the understory saw marginally increased 'Cover' of the site. 'Habitat' experienced the largest increase although still small, attributed to transect 3 conducted on the boundary of a wider tongue of vegetation extending out perpendicular to the channel, therefore overall sampled vegetation length was greater in 2024. Inspections of riparian conditions found a reduction of standing dead trees, seeing a partial reduction in 'Debris'. A site increase in native understory regeneration and tussock grass growth enabled a marginal increase in the 'Features' during the 2024 survey. Although there was a marginal increase in the RARC score from 2023 (32.3) to 2024 (33.5), this did not change the final RARC rating of *Average*. There were no changes to the CSIRO ESA rating which remained as *Active* in 2024.



Figure 5: Loder Creek site BM35 looking upstream (left) and downstream (right).



Figure 6: Site BM35 left bank (left) and right bank (right).



Figure 7: Erosion scar along the upper right-hand bank.

3.2.3 Loder Creek site BM34

Site: BM34		27/11/24	
Coordinates (MGA56):		E	N
		323779	6388119
Method	Year	Score	Rating
RARC	2023	37	Good
	2024	37	Good
CSIRO	2023	78	Stable
	2024	78	Stable

Downstream Loder Creek monitoring site BM34 is located around 3km downstream from the junction of Loder Creek and Nine Mile Creek. The site consists of a straight drainage channel with minimal sinuosity, with V-shaped profile formed from moderately sloped banks. Surface water was present and continuous throughout the site length in 2024 however there was no observable surface flow.

Certain aspects of the BM34 site riparian condition remained unchanged from 2023, which comprises a narrow, uninterrupted band of swamp-oak and an understory of native shrubs, grasses and a variety of invasive species (**Figures 8** to **10**). The site channel and banks are for the most part, densely vegetated with minimal areas of exposed soils or active erosion features.

For the most part, the distribution of weeds remained consistent with the previous monitoring round however there was some growth among the exitsing stands throughout the site. For the 2024 survey there were only small quantities of blue heliotrope (*Heliotrope amplexicaule*) which was abundant in 2023, with a reduction in the presence of farmers friend (*Bidens pilosa*). Other weeds present within the site included fireweed (*Senecio madagascariensis*), mallow (*Modiola caroliniana*), purple top, sow thistle (*Sonchus oleraceus*), African boxthorn (*Lycium ferocissimum*) and lantana, with potential spraying resulting in the dieback of African boxthorn.

The competition between lantana and ground cover grasses resulted in some areas of dieback however, there was an overall net increase in lantana coverage. Paddys lucerne (*Sida rhombifolia*) occurred in abundance along the margins of the riparian corridor but not extending into the adjoining cleared pastures. Purple top and St Johns Wort (*Hypericum gramineum*) were predominantly confined to the adjacent pastures beyond the immediate riparian corridor, with only small quantities occurring along the upper riparian fringe. The reassessment of riparian conditions saw an increase of lantana within one transect resulting in the reduction of the score for ground cover. There were increases in indicator scores for standing dead trees and hollow bearing trees for one transect which resulted in a minor increase for ‘Debris’.

The density of common reed and spiny rush had increased in density within the channel basin, notably in close proximity to the transect location. Isolated areas throughout the channel had an abundance of the macrophyte sago pond weed (*Stuckenia pectinata*) and filamentous green alga. Macrophytes saw increased growth in 2024, with no change in the composition of species (**Figures 8** and **9**).

These subtle changes saw an increase in the overall RARC score from 36.8 (2023) to 37.3 (2024) however they did not change the final RAR rating of *Good*. The CSIRO ESA scores and overall rating were unchanged in 2024, remaining as *Stable* for BM34.



Figure 8: Loder Creek site BM34 looking upstream (left) and downstream (right) in 2023.



Figure 9: Looking upstream in site BM34 (left) and downstream (right) in 2024. Note the increase in macrophyte growth when compared to 2023 (**Figure 8**).



Figure 10: Site BM34 left bank (left) and right bank (right) in 2024.

3.2.4 Wollombi Brook site BM37

Site: BM37		4/12/24	
Coordinates (MGA56):		E	N
		313709	6388933
Method	Year	Score	Rating
RARC	2023	35	Average
	2024	35	Average
CSIRO	2023	72	Stable
	2024	72	Stable

Site BM37 is the only site located on Wollombi Brook, on the western side of MTW mining operations (**Figure 1**). The drainage basin comprises a broad channel (20 to 35m width) with steep, high banks along the eastern edge and flat floodplain banks along the western edge (**Figures 11** and **12**). Waters relatively similar to the previous survey, slightly turbid and with a sluggish flow throughout the site length. Carp were observed within the main pool, indicating the sites drought resistance.

Dense stands of common reed occupy the instream channel areas with generally sparse stands occurring along the fringes adjacent to the waters edge and along the drainage wall base, with an increase in growth in 2024. Other macrophytes occurred in lower densities, including knotweed (*Persicaria decipens*), common rush (*Juncus sp*) and river bullrush (*Bolboschoenus fluviatilis*). The canopy forming riparian trees occupy a narrow corridor along the drainage channel edge banks, which transitions into cleared pastureland beyond the immediate riparian zone. River-oak (*Casuarina cunninghamiana*) forms the dominant canopy species with small quantities of willow (*Salix sp*.), eucalypts and two small stone-fruit trees. Fencing along the upper drainage channel walls restricts livestock access to the water.

Underneath the canopy of river-oaks a layer of river oak needles carpet much of the riparian corridor, however there were renewed groundcover vegetation compared to the dry weather survey in 2023. Groundcover species included mainly grasses (couch and panic veldtgrass (*Ehrharta erecta*)), which were bright green and flourishing after recent rainfall. In addition, some weeds had begun to grow and proliferate in some areas. Isolated pockets of thistle (*Cirsium vulgare*) were interspersed throughout the site, with a more consistent presence of mallow, and small quantities of fleabane (*Conyza bonariensis*) and turkey rhubarb (*Rumex sagittatus*) along the upper edges of the riparian corridor fringe.



Figure 11: Wollombi Brook site BM37 looking upstream (left) and downstream (right) in 2024.



Figure 12: Site BM37 left bank (left) and right bank (right).

The exposed erosional scars that occur along the upper channel bank walls supported increased quantities of groundcover in 2024 (see **Figure 12** right hand side). It is likely that livestock exclusion (through fencing), and a lack of large magnitude flood events in 2024 has promoted groundcover growth along these voids.

There were no changes to the CSIRO category scores and the overall rating remained as *Stable* in 2024. While there were minor changes to the RARC category scores for 'Habitats' owing to slight increases in the riparian vegetation width across transects, to 'Cover' for the increased coverage provided by groundcover species and a minor decrease for 'Debris', resulting from an associated decrease in detrital coverage owing to increased occupation by groundcover vegetation. The changes to category scores cancelled each other out, and the overall RARC rating was unchanged in 2024, remaining as *Average.*

3.3 Loder Creek Site Visual Assessments 2024

3.3.1 Loder Creek site LC1

Site: LC1		4/12/24	
Coordinates (MGA56):		E	N
		321974	6385382
CSIRO	Year	Score	Rating
	2023	72	Stable
	2024	72	Stable

The creekline at LC1 accomodates a Mount Thorley Warkworth mine Licensed Discharge Point (LDP) and the channel banks have been stabilised with logs and jute matting underlying a boulder and cobble embankment (**Figures 13** and **14**).

Water levels were lower than those encountered for the 2023 survey, with shallow ponded water present downstream amoung the channel rock armouring, and there was no flow at the time of sampling. The swamp-oak riparian corridor is generally continuous along the right hand (southern) bank with lesser amounts of eucalypts, and fragmented along the left hand bank with a very dense swamp-oak corridor upstream and cleared section to accommodate the LDP infrastructure (**Figure 13**). The main channel area supports dense spiny rush colonisation (**Figure 13** and **14**) which has remained stable over recent years and there were no changes to the extent and density of spring rushes in 2024. The overall coverage of ground cover grasses had grown over the previous year, covering slightly more of the exposed soils present along the low profile drainage walls, and a moderate covering of casuarina needle detritus was present along both banks. No new weed species were observed with coverage remaining low, principally by sparse purple top.



Figure 13: Site LC1 looking upstream (left) and downstream (right).



Figure 14: Site LC1 left bank (left) and right bank (right).

The overall site conditions remained consistent with those observed during the previous monitoring round, as indicated by the unchanged CSIRO ESA category scores, which maintained a *Stable* rating in 2024.

3.3.2 Loder Creek site LC2

Site: LC2		4/12/24	
Coordinates (MGA56):		E	N
		322019	6385367
CSIRO	Year	Score	Rating
	2023	66	Potentially Stabilising
	2024	66	Potentially Stabilising

Site LC2 is contained within a narrow section of drainage channel with steep banks spanning the southern channel perimeter (**Figures 15** and **16**). Site conditions were mostly unchanged in 2024 and consistent with the previous monitoring survey.

The extent of groundcover grasses was slightly higher along the left-hand (northern) bank, however increases in coverage was limited to existing beds and not sufficient to warrant a change in score for the relevant CSIRO ESA category ('Vegetation on drainage line floor'). Vegetation throughout the drainage floor at LC2 is restricted to spiny rushes, and there were no noticeable changes to their extent or density for the 2024 survey.

An active source of erosion occurs along the upper southern bank edge (**Figure 17**) however the extent and condition of the feature has been consistent over the past three surveys, and there were no changes to the CSIRO category for 'particle size of materials on drainage floor' as a result of erosion sourced sedimentation.

Swamp-oak needle deposits found to be consistent with the previous monitoring round, covering most surfaces within the drainage line floor and walls. With the consistent similarities of the site the CSIRO ESA score for 2024 was unchanged with the site remaining as *Potentially stabilising*.



Figure 15: Site LC2 looking upstream (left) and looking downstream (right).



Figure 16: Site LC2 left bank (left) and right bank (right).



Figure 17: Upper right-hand bank erosion exacerbated by a fallen tree.

3.3.3 Loder Creek site LC3

Site: LC3		4/12/24	
Coordinates (MGA56):		E	N
		322087	6385446
CSIRO	Year	Score	Rating
	2023	50	Active
	2024	47	Very Active

Loder Creek site is situated in a narrow section of drainage channel with moderately steep banks along both sides of the drainage channel (**Figures 18** and **19**). A small tributary drainage swale that enters the channel from the left-hand bank (north) contains some localised erosive features (gully erosion and bank undercutting) however the catchment area for the swale is small.

Water levels were lower than those encountered during the 2023 survey however there were some moist areas in some of the deeper channel areas indicating that surface water had only recently dried out. Conditions were very similar to adjoining site LC2, with a dense swamp-oak corridor supporting a generally continuous layer of casuarina needles among both the riparian corridor wooded areas and across the drainage channel floor, indicative of a period of prolonged stability, and lack of scouring high flow events. The spiny rush growths appeared to have remained in similar densities in the channel basin in 2024. The existing erosion scars remained consistent with previous samples in condition and extent. There was an increase in silty sediments observed within channel depressions, comprising a thin clay layer deposited in the middle of the channel. As a result, the category score for ‘particle size of materials on floor’ declined to levels recorded 2021, causing a reduction in the overall CSIRO ESA score and shift from the lower limits of *Active* to the upper limits of *Very active* in 2024.



Figure 18: Site LC3 looking upstream (left) and looking downstream (right).



Figure 19: Site LC3 left hand bank (left) and right-hand bank (right).

3.3.4 Loder Creek site LC4

Site: LC4		4/12/24	
Coordinates (MGA56):		E	N
		322367	6385647
CSIRO	Year	Score	Rating
	2023	66	Potentially Stabilising
	2024	66	Potentially Stabilising

The LC4 site channel is relatively broad and flat-bottomed with a localised break in the riparian canopy corridor due to the powerline easement (**Figures 20** and **21**). The drainage channel is bordered by a near vertical, stepped bank along the left-hand side and shallow sloped bank along the right-hand side (**Figures 21** and **22**). There was no surface water observed within the site in 2024.



Figure 20: Site LC4 looking upstream (left) and looking downstream (right).



Figure 21: Site LC4 left bank (left) and right bank (right).



Figure 22: Animal tracks and active erosion blocked via felled trees.

The channel floor and walls were supported by a very dense combination of shrubs, grasses and weeds, and the small riparian trees (mostly small eucalypts) had been recently felled and left in-situ (**Figure 22**). The animal track that traverses the channel was covered by felled trees and remained exposed at the time of survey.

The pre-existing erosion features that occur along the upper left-hand bank appeared in a stable condition with minor increases in the coverage provided by grasses (mostly couch grass) and weeds in 2024, and the groundcover vegetation in general (across the broader channel area) was very dense. The composition of weeds in the channel remained consistent with the presence of grasses, spiny rush, fleabane, purple top and thistle. With site channel conditions and the riparian vegetation remaining mostly unchanged, the LC4 CSIRO ESA remained as *Potentially stabilising*.

3.3.5 Loder Creek site LC5

Site: LC5		4/12/24	
Coordinates (MGA56):		E	N
		322484	6385655
CSIRO	Year	Score	Rating
	2023	69	Potentially Stabilising
	2024	69	Potentially Stabilising

The channel basin at LC5 comprises a V-shaped channel with mostly shallow sloped banks. The riparian corridor is fragmented, bordered by continuous and dense stands of swamp-oak upstream, however the understorey and ground cover vegetation are dense (**Figures 23** and **24**). There was no surface water present during the 2024 survey, with muddy deposits among the deeper pool basins likely indicative of runoff from recent light rain events.

The overall site conditions were mostly unchanged. The active erosion scars along the upper right-hand bank were very similar in condition to the former survey occasion, and there were accumulations of fine sediments downslope from the erosion scars where grasses and rushes have continued to grow. Swamp-oak saplings continue to germinate in and around erosion scars although their growth appears to be slower than those along the channel basin (**Figures 24** and **25**), and the edge grasses occurring along the channel edges had proliferated in 2024, with couch grass now inhabiting much of the channel basin. There was no evidence of recent high flow events (in the form of scouring, debris accumulation or sedimentation).

There were no changes to any of the category scores which saw the CSIRO ESA rating remain as *Potentially stabilising* in 2024.



Figure 23: Looking upstream (left) and downstream (right) at LC5.



Figure 24: Site LC5 left bank (left) and erosion scar (right).



Figure 25: Site LC5 erosion scars with a proliferation of swamp-oak saplings.

3.3.6 Loder Creek site LC6

Site: LC6		4/12/24	
Coordinates (MGA56):		E	N
		322670	6385697
CSIRO	Year	Score	Rating
	2023	50	Active
	2024	50	Active

Site LC6 is situated in Loder Creek just upstream from the Nine Mile Creek confluence, in a V-shaped channel with moderately sloped channel walls and incised, box shaped channel. There was very little surface water contained within LC6 for the 2024 survey, with very small, shallow pools with clear water (**Figure 26**).

The CSIRO category ratings were unchanged in 2024. The swamp-oak riparian zone consists of a relatively narrow yet dense, unbroken corridor bordering the drainage channel, with a dense canopy coverage and swamp-oak needle layer limiting potential establishment of understory species (**Figure 27**). As noted for recent surveys, a significant erosion scar persists along the upper right-hand bank, actively contributing fine sediments to the creek via lateral rills and shallow incised gullies (**Figure 28**).

There was no evidence of recent increases in fine sediment deposition events, with dense casuarina needle coverage and colonisation by couch grass at the base of the riparian slope (**Figures 27** and **29**), which is probably a reflection of the lack of sporadic, flashy rainfall events over the preceding six-month period. An animal (likely kangaroo) track transecting the creek line was the only exposed track down to the channel base. The period of stability had led to casuarina seedlings and saplings continuing to grow strongly along the edges and banks of the site channel, with growth ranging from 1m to 4m in height.

There were no changes to the LC6 site CSIRO ESA score and the rating remained as *Active* in the 2024 survey.



Figure 26: Looking upstream at site LC6 (left) and looking downstream (right).



Figure 27: Site LC6 left bank (left) and right bank (right).



Figure 28: Bank erosion along upper right-hand bank at LC6.



Figure 29: Population of the lower riparian banks by couch grass and swamp-oak detritus at LC6.

3.3.7 Loder Creek site LC7

Site: LC7		4/12/24	
Coordinates (MGA56):		E	N
		322759	6385778
CSIRO	Year	Score	Rating
	2023	59	Active
	2024	59	Active

Site LC7 is located downstream of the confluence of Loder Creek and Nine Mile Creek. The channel is incised and box-shaped, meandering through a broader V-shaped valley containing some moderately sloped banks on both sides (**Figures 30** and **31**). Water levels were reduced compared to the former survey, however, intermittent pooling was present with the plague minnow and charophytes occupying surface pools, indicating some form of extended water presence. Surface waters contained a slight tannin staining (brown colouration) and were clear.

While the vegetation along the channel floor showed signs of increased growth compared to the most recent dry weather survey in 2023, there were no changes made to the scoring for ‘Vegetation on drainage line floor’ as it already returned the highest possible score. Kangaroo tracks traversing the site channel remain an active source of erosion and there were some fine silts present in the deeper channel depressions, however, the majority of the LC7 channel basin was blanketed in a layer of casuarina detritus and growths of couch grass. The CSIRO ESA scoring of *Active* was unchanged in 2024.



Figure 30: Looking upstream in LC7 (left) and looking downstream (right).



Figure 31: Site LC7 left bank (left) and right bank (right).

3.3.8 Loder Creek site LC11

Site: LC11		4/12/24	
Coordinates (MGA56):		E	N
		322881	6386043
CSIRO	Year	Score	Rating
	2023	66	Potentially Stabilising
	2024	66	Potentially Stabilising

Compared to sites upstream in Loder Creek, the LC11 stream channel consists of a broad and flat-bottomed meandering channel, with intermittently occurring stepped bank edges intersected by shallow sloped (curved) banks (**Figures 32** and **33**). Water levels remained consistent with those encountered in 2023, with continuous water throughout and abundant filamentous green alga.

The LC11 site conditions were unchanged in the 2024 survey. The riparian corridor at LC11 comprises a dense, relatively broad area of swamp-oak forest with small quantities of eucalypts. There was some growth of the understorey species, mainly lantana and African boxthorn (**Figure 33**), with a dense layering of casuarina needles and detritus along the channel bank walls. Small quantities of fleabane were noted throughout the riparian corridor. With regard to the vegetation on the drainage line floor, spiny rush and couch density along the channel edges appeared to have slightly increased (**Figure 32**) however there remain open pool areas and some bare banks covered in a swamp-oak needle layer. An active pig wallow was visible along the pool edge with evidence that pigs were spooked on the day of survey.



Figure 32: Looking upstream in LC7 (left) and looking downstream (right).



Figure 33: Site LC11 left bank (left) and right bank (right).

The overall consistency in site conditions between surveys resulted in the LC11 CSIRO ESA scores being unchanged, which remained as *Potentially stabilising* in 2024

3.3.9 Loder Creek site LC12

Site: LC12		26/11/24	
Coordinates (MGA56):		E	N
		323802	6388650
CSIRO	Year	Score	Rating
	2023	59	Active
	2024	63	Potentially Stabilising

The channel at LC12 comprises a flat-bottomed meandering channel with moderate incision into the surrounding valley floor, which is bordered by moderately sloping and higher left-hand bank and shallow sloped bank along the right-hand side (**Figures 34** and **35**). There was no observable surface flow through the site, however continuous, shallow water was present with abundant green alga and isolated beds of the macrophyte sago pond weed.

Site LC12 supports a thin, continuous swamp-oak riparian wooded corridor, bordered by cleared pastures. There is open access for livestock from the adjacent lots to the east. The understorey and groundcover species include an assortment of spiny rush, couch grasses and weeds (predominantly lantana) which occupied edge banks down to the waters edge. This was indicative of stable and low water levels experienced over recent times. Lantana was present in similar abundance to 2023 in the upper riparian corridor, accompanied by Paddys lucerne which occurred in greatest density along the pasture fringe.

As noted for recent surveys, swamp-oak detritus was abundant on the riparian and drainage line floor, occupying space directly to the water's edge, and the only notable changes in 2024 were related to vegetation within the channel.

The monitoring survey in 2022 noted a significant dieback of the spiny rush and common reeds which had not recovered in 2023. The 2024 survey saw a slight increase in the abundance of these macrophytes upstream and increase of edge vegetation downstream (**Figures 34** and **35**), resulting in an increase for the 'Vegetation on drainage line floor' category score, and overall increase in the CSIRO rating from *Active* to *Potentially stabilising* in 2024.



Figure 34: Looking upstream at LC12 in 2023 (left) and 2024 (right). Note the lack of variation of instream and channel bank vegetation between surveys.



Figure 35: Looking downstream at LC12 in 2023 (left) and 2024 (right). Note the increase of channel bank vegetation, notably on the right-hand bank between surveys.

3.3.13 Loder Creek site LC14

Site: LC14		27/11/24	
Coordinates (MGA56):		E	N
		323800	6389222
CSIRO	Year	Score	Rating
	2023	59	Active
	2024	63	Potentially Stabilising

The Loder Creek channel at LC14 comprises a flat-bottomed meandering channel with variable incision into the surrounding valley floor, with a steep bank bordering the stream along the left-hand side and shallow profile bank to the right (**Figures 36** and **37**). There was a very low trickle flow visible over the concrete causeway with clear water.

The riparian corridor is fragmented with pockets of dense swamp-oak stands, surrounded by understory species comprised of grasses (couch) and the common reed (which has significantly increased over the past year), with lesser amounts of the spiny rush and some weeds along the top of the banks (fleabane, annual beard grass (*Polypogon monospeliensis*) and purple top). Instream macrophytes at LC14 were dominated by sago pond weed with localised occurrences of arrowgrass (*Triglochin striata*) and filamentous green alga was abundant throughout the site, notably in shallow areas with high exposure.

The livestock access track the dissects the site channel appeared to have been used recently (and frequently) with areas of exposed soils and active erosion along both upper banks, however the creek bed contains a concrete causeway which minimises erosion from livestock access. The creek bend downstream continues to contain an exposed bank profile with localised bank undercutting however the extent of bank erosion is similar to 2023.



Figure 36: Looking upstream at LC14 (left) and looking downstream (right) in 2023.



Figure 37: Site LC14 left bank (left) and right bank (right).

While most features of the site drainage channel condition remain unchanged, the increase in instream vegetation (common reed) resulted in an increased category score for 'Vegetation on drainage line floor', which shifted the overall CSIRO ESA rating from the upper range of the *Active* to the lower limits of *Potentially Stabilising* in 2024.

3.3.10 Loder Creek site LC8

Site: LC8		26/11/24	
Coordinates (MGA56):		E	N
		323948	6389351
CSIRO	Year	Score	Rating
	2023	66	Potentially Stabilising
	2024	66	Potentially Stabilising

The drainage channel at LC8 comprises a steep, vertical bank along the western side and shallower sloped, stepped bank to the east, and both edges support a thin and continuous strip of riparian swamp-oak trees which are undercut in parts (**Figure 38**). The left-hand bank is steep and undercut however the mature riparian swamp-oaks provide sufficient stability to limit soil dispersal to minor localised losses on a year-to-year basis despite ongoing livestock access.

Surface water was present during the 2024 survey with a very low trickle flow of clear water through the site, and filamentous green alga was smothering most submerged surfaces throughout the pool habitats. The instream macrophyte coverage was similar to 2023, consisting of the common reed, sago pond weed, arrowgrass (*Triglochin striata*), rush (*Juncus sp*) and buttercup (*Ranunculus sp*). Along the channel floor and under the swamp-oak canopy a mix of weeds and grasses occurred amongst dense casuarina detritus.



Figure 38: Looking upstream at LC8 (left) and looking downstream (right).

Cattle access occurs throughout the site channel length. However, it appears as though the extent of active erosion features remains limited to small and localised scars along regularly used tracks. Sections of the upper left-hand bank support localised bank undercutting and the mature riparian zone swamp-oak trees appear to provide stability and minimise soil loss, as indicated by the minimal changes to exposed access tracks on a year-to-year basis.

There were minimal changes to the channel environment with no corresponding changes to the CSIRO ESA ratings, maintaining LC8 as *Potentially stabilising*.

3.3.11 Loder Creek site LC9

Site: LC9		26/11/24	
Coordinates (MGA56):		E	N
		323996	6389540
CSIRO	Year	Score	Rating
	2023	69	Potentially Stabilising
	2024	69	Potentially Stabilising

Loder Creek site LC9 channel is generally straight with low profile banks, with a dense and thin strip of swamp-oak riparian corridor up and downstream of the open channel area surrounding the middle of the site (**Figures 39** and **40**). Shallow ponded surface water was present with clear water trickling through the site at the time of survey, and there was evidence of flows up to 0.6m above current levels, as indicated by debris lines on the banks.

Spiny rushes occurred in similar quantities to the 2023 survey throughout the drainage line floor, and there with sparse occupation of common reed in wetted habitats and along pool edges.

Most of the channel basin is populated by weeds and pasture grasses with increased growth near the swamp-oak canopy, however the blanketing of swamp-oak needles appears to continue to limit the establishment of understorey species under the dense riparian canopy (**Figure 39**). Edge areas exhibited small increases in the presence of the common reed, populating areas previously heavily damaged by cattle prints. Erosion points along channel walls appeared to have similar pasture grasses compared to 2023. However, there was a strong presence of cattle damage to the stream edge with soft muds and deep hoofprints (up to 40cm deep) (**Figure 40**).

There were no changes at LC9 resulting in the CSIRO ESA scores remaining unchanged and the site maintaining a *Potentially Stabilising* status



Figure 39: Site LC9 left bank (left) and right bank (right).



Figure 40: Site LC9 Looking down from the right bank into the site (left) and the minimal water present (right).

3.3.12 Loder Creek site LC10

Site: LC10		26/11/24	
Coordinates (MGA56):		E	N
		324131	6390142
CSIRO	Year	Score	Rating
	2023	63	Potentially Stabilising
	2024	63	Potentially Stabilising

Site LC10 is located in the lower limits of Loder Creek at a concrete causeway with a narrow 100mm piped culvert (**Figures 41** and **42**). The channel is incised into the surrounding valley floor, and moderately steep V-shaped banks along both sides of the creek (reaching 5 to 8m above the channel floor), with bank undercutting prevalent throughout the section. Waters were slightly turbid with low flow through the culvert crossing during the 2024 survey.

With the exception of the narrow and fragmented band of riparian swamp-oak trees, pasture grasses provide the main source of sediment stabilisation in the riparian zone. Long term conditions at LC10 have remained stable with the riparian bank vegetation and erosional features consistent with previous surveys, which are characterised by steep banks which are undercut in parts. Algae proliferation in the upstream pool had resulted in most surfaces being covered (**Figure 41**), and there was no evidence of any recent high flow events, suggesting the at the channel had been subjected stable water levels for a prolonged period of time. There were no changes to the LC10 CSIRO ESA category scores in 2024, and continued a site rating of *Potentially Stabilising*.



Figure 41: Site LC10 looking upstream from causeway left (left) and looking downstream from just below causeway (right).



Figure 42: LC10 looking upstream towards the causeway, showing the undercut and eroded banks stabilised by swamp-oaks.

3.3.13 Loder Creek site LC15

Site: LC15		27/11/24	
Coordinates (MGA56):		E	N
		324150	6390239
CSIRO	Year	Score	Rating
	2023	53	Active
	2024	53	Active

Site LC15 is contained in a generally straight section of drainage, within a V-shaped valley with stream channel incised into the surrounding valley floor at depths of 8 to 10m. The creekline contains moderately steep to near vertical sections of bank along both sides with bank undercutting and stepped bank walls prevalent throughout the section as a result of livestock access and fluvial processes (**Figures 43** and **44**). Surface waters were slightly turbid with a low trickle flow through the site for the 2024 survey, however one isolated 15m section of pool downstream had noticeably more turbid water (**Figure 43**), indicative of recent livestock access.

The riparian strip is comprised of a narrow and fragmented band of mature swamp-oaks, supplemented by dominant pasture grasses, abundant thistle and smaller quantities of fennel (*Foeniculum vulgare*), dock (*Rumex sp.*) and buchan (*Hirschfeldia incana*) along both banks (**Figure 46**). Filamentous green alga occurred in abundance throughout the site pools with small quantities of submerged macrophytes sago pond weed and curly pondweed (*Potamogeton crispus*).

The eastern (right-hand) bank contained an extensive erosion scar along its upper edges, with minor evidence of recent erosion from the scar void, however weed and grass growth had begun to repopulate areas of loose sediment. The left bank consisted of stepped banks due to livestock tracks, densely populated by grass and without any active erosion. Some areas of exposed soils are a potential erosion source and should be monitored.

There were no changes to the CSIRO ESA which remained as *Stable* for the 2024 survey.



Figure 43: Site LC15 looking upstream (left) and looking downstream (right).



Figure 44: LC15 left bank (left) and right bank (right).

3.3.13 Loder Creek site LC13

Site: LC13		26/11/24	
Coordinates (MGA56):		E	N
		324160	6390408
CSIRO	Year	Score	Rating
	2023	63	Potentially Stabilising
	2024	63	Potentially Stabilising

The channel form at LC13 is similar to that noted for LC10, and consists of a V-shaped channel, deeply incised (7 to 10m) into the surrounding catchment area with fragmented riparian corridor consisting of mature she-oak and eucalypts (**Figures 45** and **46**). Water was turbid with no observable flow and abundant filamentous green alga throughout the site.

The channel walls and edge banks continue to provide thoroughfare for livestock however the tracks appear to be in a stable condition, being covered with dense pasture grasses and weed growth (mostly thistles and fleabane) which showed signs of minor proliferation compared to 2023, however the minor change in growth did not warrant an increase in 'Vegetation on Drainage Line Walls' scores, as many of the species are annuals. The LC13 site CSIRO ESA scores was unchanged in 2024 and remained as *Potentially Stabilising*.



Figure 45: Looking upstream in 2023 (left) and 2024 (right).



Figure 46: Looking downstream in 2023 (left) and 2024 (right) at LC13.

3.3.13 Loder Creek site LC16

Site: LC16		27/11/24	
Coordinates (MGA56):		E	N
		324329	6390543
CSIRO	Year	Score	Rating
	2023	53	Active
	2024	56	Active

Site LC16 is located in the lower limits of Loder Creek, around 150m upstream from the confluence of the Hunter River. The channel banks are moderately sloped with very sparse occurrences of trees (gaps of 50m or more) (**Figures 47** and **48**). Water was mostly clear with no observable surface flow, and filamentous green alga occurred in abundance.

The 2023 survey provided updates on the recovery from flood impacts observed in the downstream limits of LC16 for the 2022 survey, where significant quantities of mud were deposited along the channel edge banks and bed (MPR 2024). Conditions encountered for the 2024 survey show that groundcover vegetation along the channel bank edges and walls had generally increased in coverage and density compared to in 2023, consisting of pasture grasses and weeds, including thistle, sow thistle, dock (*Rumex sp*), green cestrum, purple top and Buchan weed.

The lower channel bank walls and pool edges supported dense stands of emergent macrophytes such as common reed, cumbungi (*Typha sp*), river bullrush and river clubrush (*Schoenoplectus Validus*) (**Figure 47**). Juvenile macrophytes continued to germinate and were progressing further into the channel basin.

The large erosion void occurring along the upper right-hand bank had begun to be repopulated by both pasture grasses and weeds, with a decreased in the extent of exposed soils to less than 1m in height. Notwithstanding, the channel area at LC16 remains highly susceptible to large magnitude flood induced scouring and potential exacerbation of the existing, and substantial erosion scars, as the riparian corridor is deficient of any form of riparian corridor.

A re-evaluation of the degree of exposure of the channel walls resulted in an improved category score for 'Nature of Drainage Line Wall materials' and overall CSIRO ESA score (2023 (53), 2024 (56)), however the site remained as *Active*.



Figure 47: Looking upstream (left) and downstream (right) at site LC16 in 2024.



Figure 48: Looking along the left-hand bank at LC16 (left) and right-hand bank (right).



Figure 49: Looking upstream at minor erosion along the along the right-hand stream edge bank at LC16 (roughly 10cm in height).

4 SUMMARY

Marine Pollution Research was engaged by MTW to undertake stream health and channel stability monitoring of creek line drainages adjacent to the MTW open cut mining operations in the upper Hunter Valley, NSW, to meet the requirements outlined in Section 7.4 of the approved WMP (Version 5.1, October 2021). This report provides the results for the 2024 Annual Stream health and Channel Stability monitoring survey undertaken in November and December 2024.

The annual MTW stream health and channel stability monitoring survey was undertaken following a year of close to average rainfall patterns, characterised by variable and occasionally intense rainfall early in the year with increasing frequency and duration of dry spells during winter and over the months leading into the 2024 survey period. Despite some low to moderate flood activity between April and June, stream flows and water levels in Wollombi brook were generally stable and gradually receding over the latter half of the year. Mount Thorley Warkworth Mine participates in the Hunter River Salinity Trading Scheme (HRSTS) and discharged a total of 135 ML from the MTW LDP over seven discharge days in April and June 2024.

Table 4 below provides a summary of results for RARC and CSIRO over the past three years. Most of the CSIRO category scores remained unchanged and reflected the consistency in condition of site streambed and channel banks among study area drainages in 2024, which were attributed to the lack of intense rainfall and flashy flow events. While subtle differences were detected for some of the CSIRO category features (e.g., changes in the distribution of vegetation on the drainage line floor or walls), most of the observations were insignificant enough to warrant changes in category scores, or existing scores were already at the maximum.

There were only four changes recorded for individual CSIRO category scores in 2024, owing to increases in vegetation occurring along the drainage line floor (LC12 and LC14), decreases in the degree of exposure along channel walls (LC16) or increases in the presence of fine sediments within the channel floor (LC3). While the change in score was not sufficient to change the overall CSIRO rating at LC16, Loder Creek site LC3 experienced a reduction in rating from *Active* to *Very Active*, with LC12 and LC14 both increasing ratings from *Active* to *Potentially Stabilising*. Note that site LC3 and LC12 have recorded fluctuations for these respective categories over the past two to four years.

The changes in scores at LC12, LC14 and (in part) LC16 are attributable to vegetation community responses to climatic conditions, whereas the changes at LC3 are attributable to natural fluvial processes (i.e., the downstream transport of catchment sourced sediments). Although some of the existing erosion scars, rills and gullies are considered active (unconsolidated in parts, and contributing sediments during wet weather events), there were no significant changes to the extent or prevalence of new erosion features at any of the sites, and where losses of fine sediments have been observed, there has usually been an associated response by vegetation (e.g. colonisation of settled colluvial sediments before entering the drainage channel at LC5 and LC6).

The Stream Health Monitoring RARC results in 2024 have showed consistency over the previous three surveys (**Table 4**), enduring shifting environmental conditions. There were no changes to the RARC classification ratings in 2024, which included *Average* (Loder Creek site BM35, new site MTW LDP2 and Wollombi Brook site BM37) and *Good* (Loder Creek site BM34). These results can be attributed to the stability of riparian corridors primarily supported by the presence of mature canopy species, such as river-oak and swamp-oak, which contribute to detritus and structural debris, albeit with limited understory complexity.

Whilst each of the Stream Health Monitoring sites contain generally continuous riparian corridors dominated by swamp-oak (BM22, BM34 and BM35) or river-oak (BM37) canopy forming species, associated site-specific riparian and habitat features contribute to the observed variation in category scores and overall ratings. Localised erosion features are for the most part, restricted to the upper margins of the drainage channel in Loder Creek, where active bank erosion, slumped trees, and animal tracks (from livestock and wild pigs) contribute fine sediment to the creek line. Colonisation of the deposited fine sediments by vegetation (mostly grasses, swamp-oak saplings and weeds) has been observed in some areas, and although there has been some sparse colonisation of the erosion scars at the source (by swamp-oak saplings and weeds), the soil properties appear to be generally inhibitive to seed propagation, comprising a firm crust of clayey sand.

Recent exclusion of livestock from pasturelands adjacent to sites BM34 and BM37 has supported gradual riparian recovery, and although site conditions remain influenced by competition from invasive species and animal disturbance, remediation actions such as targeted weed spraying appear to be effective in mitigating seasonal outbreaks of weeds.

It was previously recommended that the MTW LDP stream health channel stability monitoring site be relocated for future monitoring. Site MTW LDP2 was established in a section of ‘natural’ channel around 50m downstream from the former survey site MTW LDP, contained in a more appropriate location capable of detecting potential erosion and deposition events resulting from stream flows. The CSIRO ESA and RARC assessments returned ratings of *Average* and *Potentially Stabilising*, which were consistent with those recorded at former site MTW LDP.

In summary, the MTW 2024 Stream Health and Channel Stability monitoring results underscore the resilience of riparian and channel systems despite ongoing pressures from erosion and changing conditions. Continued management interventions, including the control of invasive species, erosion mitigation and stream health monitoring are recommended to further enhance site stability and ecological condition over time.

Table 4 MTW RARC and CSIRO Summary Results 2018 to 2024						
	RARC			CSIRO		
	Nov-22	Dec-23	Nov-24	Nov-22	Dec-23	Nov-24
MTW LDP2	NA	NA	Average	NA	NA	Potentially Stabilising
BM34	Average	Good	Good	Stable	Stable	Stable
BM35	Average	Average	Average	Active	Active	Active
BM37	Average	Average	Average	Potentially Stabilising	Stable	Stable
LC1	NA	NA	NA	Stable	Stable	Stable
LC2	NA	NA	NA	Active	Potentially Stabilising	Potentially Stabilising
LC3	NA	NA	NA	Very Active	Active	Very Active
LC4	NA	NA	NA	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising
LC5	NA	NA	NA	Active	Potentially Stabilising	Potentially Stabilising
LC6	NA	NA	NA	Active	Active	Active
LC7	NA	NA	NA	Active	Active	Active
LC8	NA	NA	NA	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising
LC9	NA	NA	NA	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising
LC10	NA	NA	NA	Active	Potentially Stabilising	Potentially Stabilising
LC11	NA	NA	NA	N.A.	Potentially Stabilising	Potentially Stabilising
LC12	NA	NA	NA	Potentially Stabilising	Active	Potentially Stabilising
LC13	NA	NA	NA	Potentially Stabilising	Potentially Stabilising	Potentially Stabilising
LC14	NA	NA	NA	Active	Active	Potentially Stabilising
LC15	NA	NA	NA	Active	Active	Active
LC16	NA	NA	NA	Active	Active	Active

5 REFERENCES

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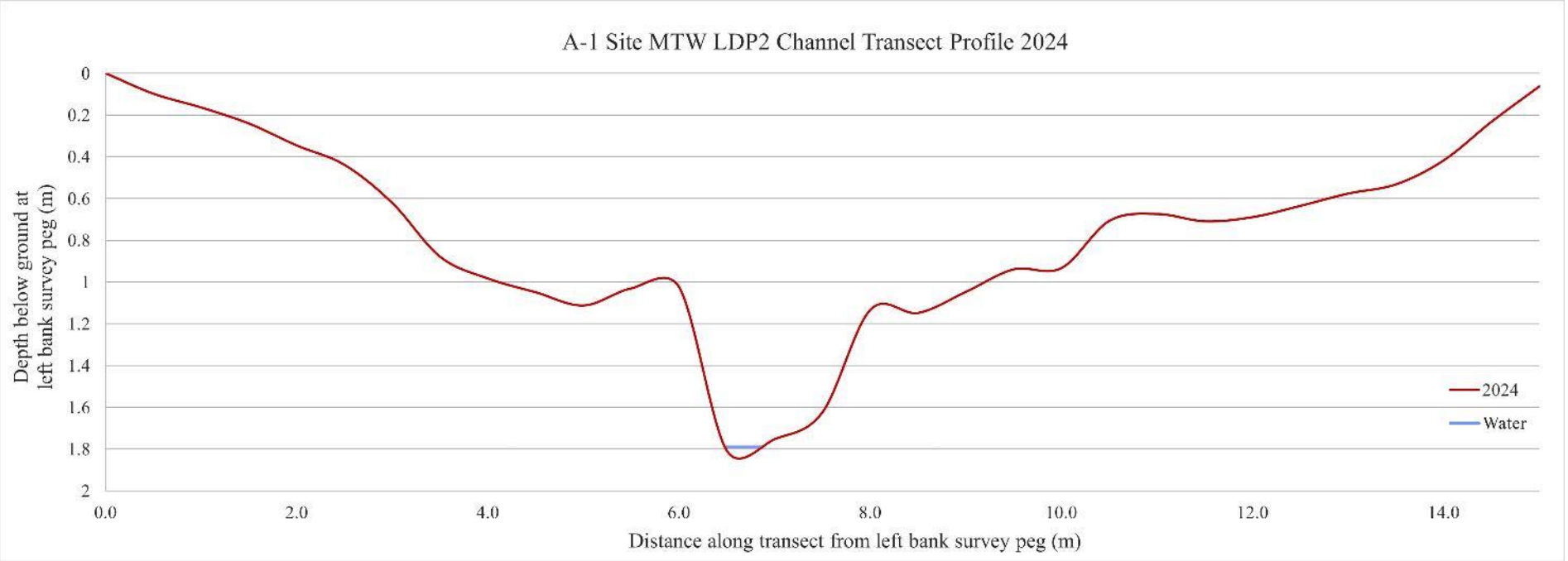
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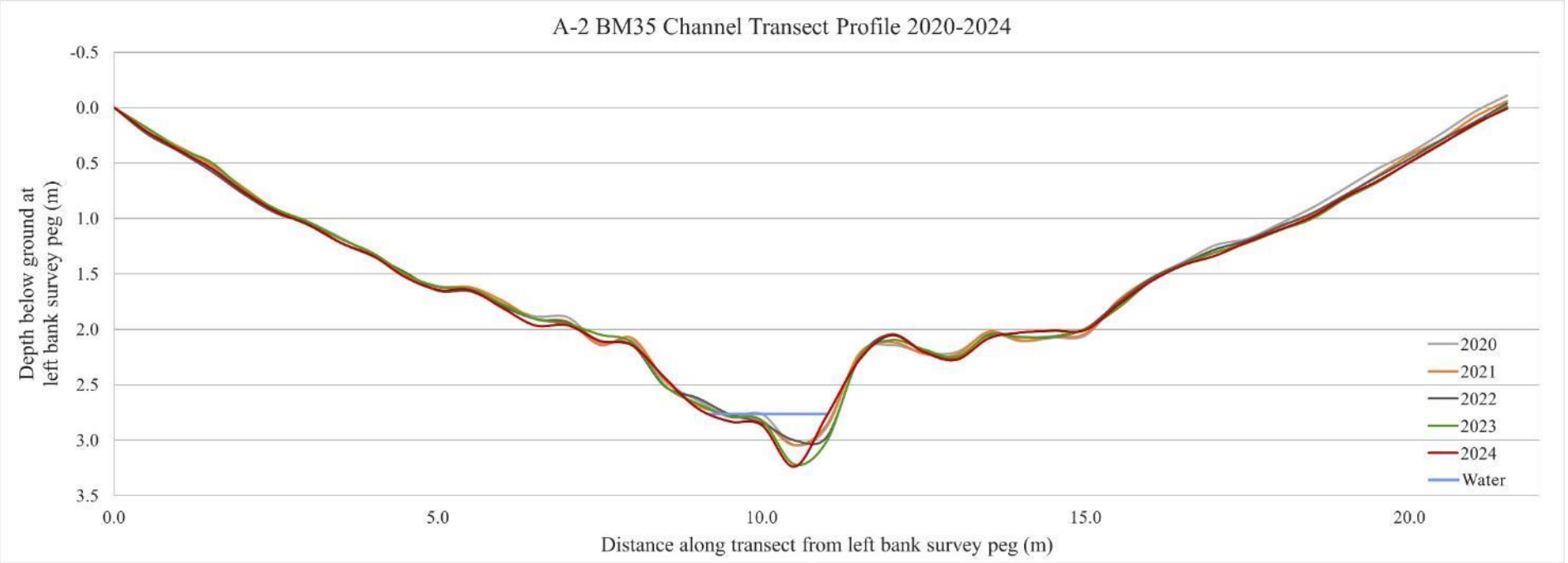
APPENDIX A

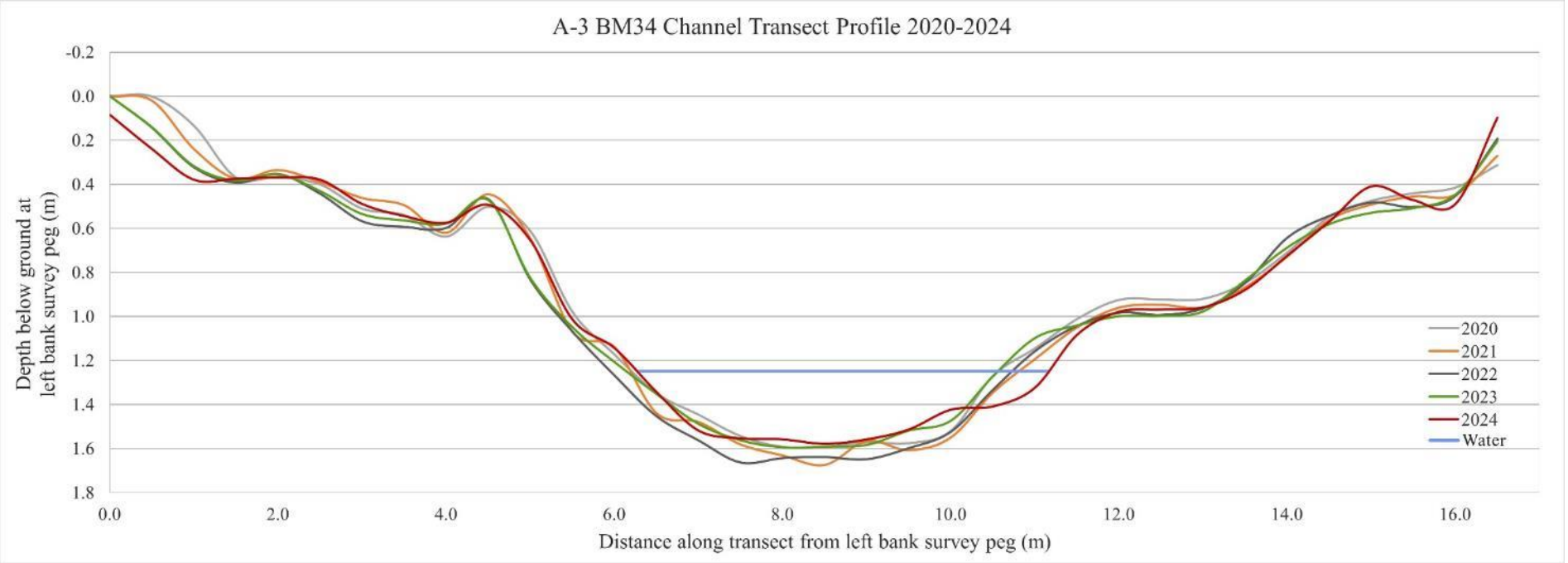
STREAM HEALTH & STABILITY

MONITORING SITE

CHANNEL TRANSECTS


A-1 Site MTW LDP2 Channel Transect Profile 2024
Depth below ground at left bank survey peg (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Distance along transect from left bank survey peg (m)
2024
Water


A-2 BM35 Channel Transect Profile 2020-2024
Depth below ground at left bank survey peg (m)
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0.0
5.0
10.0
15.0
20.0
Distance along transect from left bank survey peg (m)
2020
2021
2022
2023
2024
Water


A-3 BM34 Channel Transect Profile 2020-2024
Depth below ground at left bank survey peg (m)
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
Distance along transect from left bank survey peg (m)
2020
2021
2022
2023
2024
Water

APPENDIX B

STREAM HEALTH & STABILITY

MONITORING SITE

RARC FIELDSHEET DATA

Rapid Appraisal of Riparian Condition

Site:	Loder Creek			Site Number	MTW LDP2
Date:	4/12/2024	Observer:	JB + AG		

Longitudinal continuity of riparian canopy vegetation (>5m wide)

Map	Score
	3

0 = <50%, 1 = 50-64%, 2 = 65-79%, 3 = 80-94%, 4 = ≥95% vegetated bank; with ½ point subtracted for each significant discontinuity (>50m long)

Width of riparian canopy vegetation

Transect	Channel Width (CW)	Vegetation Width (VW)	Score
1	2	25	3
2	2	50	4
3	2	20	3
4	2	50	4
Average	2	36.25	3.5

Channel ≤10m wide: 0 = VW <5m, 1 = VW 5-9m , 2 = VW 10-19m, 3 = VW 20-39m, 4 = VW ≥40m

Channel >10m wide: 0 = VW/CW <0.5, 1 = VW/CW 0.5-0.9, 2 = VW/CW 1-1.9, 3 = VW/CW 2-3.9, 4 = VW/CW ≥4

Proximity

Score
2

Nearest patch of native vegetation >10ha:

0 = >1km, 1 = 200m-1km, 2 = contiguous,

3 = contiguous with patch >50ha

Vegetation cover: Canopy >5m, Understorey 1-5m, Ground cover <1m

Transect	Canopy	Native canopy	Understorey	Native understorey	Ground cover	Native ground cover	# layers
1	3	3	1	1	1	1	3
2	3	3	1	1	1	1	3
3	2	2	1	2	2	1	3
4	3	2	2	2	1	1	3
Average	2.75	2.5	1.25	1.5	1.25	1	3

Canopy and ground cover: 0 = none, 1 = 1-30%, 2 = 31-60%, 3 = >60%

Understorey cover: 0 = none, 1 = 1-5%, 2 = 6-30%, 3 = >30%

Debris

Transect	Leaf litter	Native leaf litter	Standing dead trees	Hollow-bearing trees	Fallen logs
1	3	3	1	0	1
2	3	3	0	0	1
3	3	3	0	0	1
4	3	3	1	0	1
Average	3	3	0.5	0	1

Leaf litter & native leaf litter cover: 0 = none, 1 = 1-30%, 2 = 31-60%, 3 = >60%

Standing dead trees (>20cm dbh) & hollow-bearing trees: 0 = absent, 1 = present

Fallen logs (>10cm diameter): 0 = none, 1 = small quantities, 2 = abundant

Features

Transect	Native canopy species	Native understorey	Large native tussock grasses	Reeds
1	1	1		0
2	1	1		0
3	1	1	1	0
4	1	1	1	0
Average	1	1	1	0

Regeneration <1m tall: 0 = none, 1 = scattered, and 2 = abundant, with ½ point subtracted for grazing damage

Reeds & large tussock grasses: 0 = none, 1 = scattered, and 2 = abundant

Calculation of scores

Site Number:	MTW LDP2

Longitudinal continuity of riparian canopy vegetation

Score
3.5

Width of riparian canopy vegetation

Average	3.5

Proximity

Score
1

Vegetation cover

	Canopy	Native canopy	Understorey	Native understorey	Ground cover	Native ground cover	# layers
Average	2.75	2.5	1.25	1.5	1.25	1	3

Debris

	Leaf litter	Native leaf litter	Standing dead trees	Hollow-bearing trees	Fallen logs
Average	3	3	0.5	0	1

Features

	Native canopy species	Native understorey	Large native tussock grasses	Reeds
Average	1	1	1	0

TOTALS

Site:	Habitat	Cover	Natives	Debris	Features	**Total**
(out of)	11	12	9	10	8	50
	8	8.25	5	7.5	3	31.75

Rapid Appraisal of Riparian Condition

Site:	Nine Mile Creek			Site Number	BM34
Date:	27/11/2024	Observer:	JB + OB		

Longitudinal continuity of riparian canopy vegetation (>5m wide)

Map	Score
	4

0 = <50%, 1 = 50-64%, 2 = 65-79%, 3 = 80-94%, 4 = ≥95% vegetated bank; with ½ point subtracted for each significant discontinuity (>50m long)

Width of riparian canopy vegetation

Transect	Channel Width (CW)	Vegetation Width (VW)	Score
1	5	80	4
2	5	35	3
3	5	25	3
4	5	35	3
Average			3.25

Proximity

Score
2

Nearest patch of native vegetation >10ha:
0 = >1km, 1 = 200m-1km, 2 = contiguous,
3 = contiguous with patch >50ha

Channel ≤10m wide: 0 = VW <5m, 1 = VW 5-9m , 2 = VW 10-19m, 3 = VW 20-39m, 4 = VW ≥40m

Channel >10m wide: 0 = VW/CW <0.5, 1 = VW/CW 0.5-0.9, 2 = VW/CW 1-1.9, 3 = VW/CW 2-3.9, 4 = VW/CW ≥4

Vegetation cover: Canopy >5m, Understorey 1-5m, Ground cover <1m

Transect	Canopy	Native canopy	Understorey	Native understorey	Ground cover	Native ground cover	# layers
1	3	3	3	1	3	2	3
2	3	3	3	1	2	2	3
3	3	3	2	1	3	2	3
4	3	3	3	1	3	2	3
Average	3	3	2.75	1	2.75	2	3

Canopy and ground cover: 0 = none, 1 = 1-30%, 2 = 31-60%, 3 = >60%

Understorey cover: 0 = none, 1 = 1-5%, 2 = 6-30%, 3 = >30%

Debris

Transect	Leaf litter	Native leaf litter	Standing dead trees	Hollow-bearing trees	Fallen logs
1	2	2	1	1	1
2	2	2	0	0	1
3	2	2	0	0	1
4	2	2	1	0	1
Average	2	2	0.5	0.25	1

Leaf litter & native leaf litter cover: 0 = none, 1 = 1-30%, 2 = 31-60%, 3 = >60%

Standing dead trees (>20cm dbh) & hollow-bearing trees: 0 = absent, 1 = present

Fallen logs (>10cm diameter): 0 = none, 1 = small quantities, 2 = abundant

Features

Transect	Native canopy species	Native understorey	Large native tussock grasses	Reeds
1	1	1	1	2
2	1	1	1	1
3	1	1	1	2
4	1	1	1	2
Average	1	1	1	1.75

Regeneration <1m tall: 0 = none, 1 = scattered, and 2 = abundant, with ½ point subtracted for grazing damage

Reeds & large tussock grasses: 0 = none, 1 = scattered, and 2 = abundant

Calculation of scores

Site Number:	BM34

Longitudinal continuity of riparian canopy vegetation

Score
4

Width of riparian canopy vegetation

Average	3.25

Proximity

Score
2

Vegetation cover

	Canopy	Native canopy	Understorey	Native understorey	Ground cover	Native ground cover	# layers
Average	3	3	2.75	1	2.75	2	3

Debris

	Leaf litter	Native leaf litter	Standing dead trees	Hollow-bearing trees	Fallen logs
Average	2	2	0.5	0.25	1

Features

	Native canopy species	Native understorey	Large native tussock grasses	Reeds
Average	1	1	1	1.75

TOTALS

Site:	Habitat	Cover	Natives	Debris	Features	**Total**
(out of)	11	12	9	10	8	50
	9.25	11.5	6	5.75	4.75	37.25

Rapid Appraisal of Riparian Condition

Site:	Nine Mile Creek			Site Number	BM35
Date:	04/12/24	Observer:	JB + AG		

Longitudinal continuity of riparian canopy vegetation (>5m wide)

Map	Score
	3

0 = <50%, 1 = 50-64%, 2 = 65-79%, 3 = 80-94%, 4 = ≥95% vegetated bank; with ½ point subtracted for each significant discontinuity (>50m long)

Width of riparian canopy vegetation

Transect	Channel Width (CW)	Vegetation Width (VW)	Score
1	5	50	4
2	3	20	3
3	6	50	4
4	5	55	4
Average			3.75

Proximity

Score
3

Nearest patch of native vegetation >10ha:
0 = >1km, 1 = 200m-1km, 2 = contiguous,
3 = contiguous with patch >50ha

Channel ≤10m wide: 0 = VW <5m, 1 = VW 5-9m , 2 = VW 10-19m, 3 = VW 20-39m, 4 = VW ≥40m

Channel >10m wide: 0 = VW/CW <0.5, 1 = VW/CW 0.5-0.9, 2 = VW/CW 1-1.9, 3 = VW/CW 2-3.9, 4 = VW/CW ≥4

Vegetation cover: Canopy >5m, Understorey 1-5m, Ground cover <1m

Transect	Canopy	Native canopy	Understorey	Native understorey	Ground cover	Native ground cover	# layers
1	3	2	2	1	1	1	3
2	3	3	2	1	1	1	3
3	3	3	2	1	2	1	3
4	3	3	3	0	1	0	3
Average	3	2.75	2.25	0.75	1.25	0.75	3

Canopy and ground cover: 0 = none, 1 = 1-30%, 2 = 31-60%, 3 = >60%

Understorey cover: 0 = none, 1 = 1-5%, 2 = 6-30%, 3 = >30%

Debris

Transect	Leaf litter	Native leaf litter	Standing dead trees	Hollow-bearing trees	Fallen logs
1	3	3	0	0	1
2	3	3	0	0	0
3	3	3	0	0	1
4	3	3	1	0	1
Average	3	3	0.25	0	0.75

Leaf litter & native leaf litter cover: 0 = none, 1 = 1-30%, 2 = 31-60%, 3 = >60%

Standing dead trees (>20cm dbh) & hollow-bearing trees: 0 = absent, 1 = present

Fallen logs (>10cm diameter): 0 = none, 1 = small quantities, 2 = abundant

Features

Transect	Native canopy species	Native understorey	Large native tussock grasses	Reeds
1	1	0	1	0
2	1	1	1	1
3	1	1	1	0
4	1	0	1	1
Average	1	0.5	1	0.5

Regeneration <1m tall: 0 = none, 1 = scattered, and 2 = abundant, with ½ point subtracted for grazing damage

Reeds & large tussock grasses: 0 = none, 1 = scattered, and 2 = abundant

Calculation of scores

Site Number:	BM35

Longitudinal continuity of riparian canopy vegetation

Score
3

Width of riparian canopy vegetation

Average	3.75

Proximity

Score
3

Vegetation cover

	Canopy	Native canopy	Understorey	Native understorey	Ground cover	Native ground cover	# layers
Average	3	2.75	2.25	0.75	1.25	0.75	3

Debris

	Leaf litter	Native leaf litter	Standing dead trees	Hollow-bearing trees	Fallen logs
Average	3	3	0.25	0	0.75

Features

	Native canopy species	Native understorey	Large native tussock grasses	Reeds
Average	1	0.5	1	0.5

TOTALS

Site:	Habitat	Cover	Natives	Debris	Features	**Total**
(out of)	11	12	9	10	8	50
	9.75	9.5	4.25	7	3	33.5

Rapid Appraisal of Riparian Condition

Site:	Wollombi Brook			Site Number	BM37
Date:	4/12/2024	Observer:	JB + AG		

Longitudinal continuity of riparian canopy vegetation (>5m wide)

Map	Score
	3.5

0 = <50%, 1 = 50-64%, 2 = 65-79%, 3 = 80-94%, 4 = ≥95% vegetated bank; with ½ point subtracted for each significant discontinuity (>50m long)

Width of riparian canopy vegetation

Transect	Channel Width (CW)	Vegetation Width (VW)	Score
1	18	20	3
2	12	19	3
3	18	23	3
4	20	30	3
Average	17	23	3

Channel ≤10m wide: 0 = VW <5m, 1 = VW 5-9m , 2 = VW 10-19m, 3 = VW 20-39m, 4 = VW ≥40m

Channel >10m wide: 0 = VW/CW <0.5, 1 = VW/CW 0.5-0.9, 2 = VW/CW 1-1.9, 3 = VW/CW 2-3.9, 4 = VW/CW ≥4

Proximity

Score
2

Nearest patch of native vegetation >10ha:

0 = >1km, 1 = 200m-1km, 2 = contiguous,

3 = contiguous with patch >50ha

Vegetation cover: Canopy >5m, Understorey 1-5m, Ground cover <1m

Transect	Canopy	Native canopy	Understorey	Native understorey	Ground cover	Native ground cover	# layers
1	2	2	2	1	2	2	3
2	3	3	2	1	3	2	3
3	3	3	2	1	3	2	3
4	2	2	2	2	2	2	3
Average	2.5	2.5	2	1.25	2.5	2	3

Canopy and ground cover: 0 = none, 1 = 1-30%, 2 = 31-60%, 3 = >60%

Understorey cover: 0 = none, 1 = 1-5%, 2 = 6-30%, 3 = >30%

Debris

Transect	Leaf litter	Native leaf litter	Standing dead trees	Hollow-bearing trees	Fallen logs
1	2	2	1	0	2
2	2	2	1	0	2
3	2	2	1	0	2
4	2	2	0	0	2
Average	2	2	0.75	0	2

Leaf litter & native leaf litter cover: 0 = none, 1 = 1-30%, 2 = 31-60%, 3 = >60%

Standing dead trees (>20cm dbh) & hollow-bearing trees: 0 = absent, 1 = present

Fallen logs (>10cm diameter): 0 = none, 1 = small quantities, 2 = abundant

Features

Transect	Native canopy species	Native understorey	Large native tussock grasses	Reeds
1	1	0	1	2
2	1	0	1	1
3	0	0	1	2
4	0	1	1	2
Average	0.5	0.25	1	1.75

Regeneration <1m tall: 0 = none, 1 = scattered, and 2 = abundant, with ½ point subtracted for grazing damage

Reeds & large tussock grasses: 0 = none, 1 = scattered, and 2 = abundant

Calculation of scores

Site Number:	BM37

Longitudinal continuity of riparian canopy vegetation

Score
3.5

Width of riparian canopy vegetation

Average	3

Proximity

Score
2

Vegetation cover

	Canopy	Native canopy	Understorey	Native understorey	Ground cover	Native ground cover	# layers
Average	2.5	2.5	2	1.25	2.5	2	3

Debris

	Leaf litter	Native leaf litter	Standing dead trees	Hollow-bearing trees	Fallen logs
Average	2	2	0.75	0	2

Features

	Native canopy species	Native understorey	Large native tussock grasses	Reeds
Average	0.5	0.25	1	1.75

TOTALS

Site:	Habitat	Cover	Natives	Debris	Features	**Total**
(out of)	11	12	9	10	8	50
	8.5	10	5.75	6.75	3.5	34.5

APPENDIX C

STREAM HEALTH & STABILITY

MONITORING SITE

CSIRO ESA FIELDSHEET DATA

BSO CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Dec-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	MPR	MPR	MPR
LC1	Vegetation on D/L floor	1-3	3	3	3
	Vegetation on D/L walls	1-3	3	3	3
	Shape & aspect ratio of D/L cross-section	1-5	3	3	3
	Longitudinal morphology of D/L	1-4	3	3	3
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-4	3	3	3
	Shape of stream bordering flats/ slopes	1-5	4	4	4
	Nature of lateral flow regulation into D/L	1-5	3	3	3
	Sum of Scores		**23**	**23**	**23**
	Activity Score		**72**	**72**	**72**
	Classification		**Stable**	**Stable**	**Stable**
LC2	Vegetation on D/L floor	1-3	3	3	3
	Vegetation on D/L walls	1-3	2	2	2
	Shape & aspect ratio of D/L cross-section	1-5	3	3	3
	Longitudinal morphology of D/L	1-4	2	2	2
	Particle size of materials on foor	1-3	2	2	2
	Nature of D/L wall materials	1-4	1	1	1
	Shape of stream bordering flats/ slopes	1-5	4	4	4
	Nature of lateral flow regulation into D/L	1-5	4	4	4
	Sum of Scores		**21**	**21**	**21**
	Activity Score		**66**	**66**	**66**
	Classification		**Potentially Stabilising**	**Potentially Stabilising**	**Potentially Stabilising**

BSO CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Dec-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	MPR	MPR	MPR
LC3	Vegetation on D/L floor	1-3	3	3	3
	Vegetation on D/L walls	1-3	1	1	1
	Shape & aspect ratio of D/L cross-section	1-5	2	2	2
	Longitudinal morphology of D/L	1-4	2	2	2
	Particle size of materials on foor	1-3	2	2	1
	Nature of D/L wall materials	1-4	1	1	1
	Shape of stream bordering flats/ slopes	1-5	3	3	3
	Nature of lateral flow regulation into D/L	1-5	2	2	2
	Sum of Scores		**16**	**16**	**15**
	Activity Score		**50**	**50**	**47**
	Classification		**Active**	**Active**	**Very Active**
LC4	Vegetation on D/L floor	1-3	3	3	3
	Vegetation on D/L walls	1-3	3	3	3
	Shape & aspect ratio of D/L cross-section	1-5	2	2	2
	Longitudinal morphology of D/L	1-4	3	3	3
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-4	1	1	1
	Shape of stream bordering flats/ slopes	1-5	4	4	4
	Nature of lateral flow regulation into D/L	1-5	4	4	4
	Sum of Scores		**21**	**21**	**21**
	Activity Score		**66**	**66**	**66**
	Classification		**Potentially Stabilising**	**Potentially Stabilising**	**Potentially Stabilising**

BSO CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Dec-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	MPR	MPR	MPR
LC5	Vegetation on D/L floor	1-3	3	3	3
	Vegetation on D/L walls	1-3	2	2	2
	Shape & aspect ratio of D/L cross-section	1-5	3	3	3
	Longitudinal morphology of D/L	1-4	3	3	3
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-4	3	3	3
	Shape of stream bordering flats/ slopes	1-5	3	3	3
	Nature of lateral flow regulation into D/L	1-5	4	4	4
	Sum of Scores		**22**	**22**	**22**
	Activity Score		**69**	**69**	**69**
	Classification		**Potentially Stabilising**	**Potentially Stabilising**	**Potentially Stabilising**
LC6	Vegetation on D/L floor	1-3	2	2	2
	Vegetation on D/L walls	1-3	2	2	2
	Shape & aspect ratio of D/L cross-section	1-5	2	2	2
	Longitudinal morphology of D/L	1-4	2	2	2
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-4	1	1	1
	Shape of stream bordering flats/ slopes	1-5	3	3	3
	Nature of lateral flow regulation into D/L	1-5	3	3	3
	Sum of Scores		**16**	**16**	**16**
	Activity Score		**50**	**50**	**50**
	Classification		**Active**	**Active**	**Active**

BSO CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Dec-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	MPR	MPR	MPR
LC7	Vegetation on D/L floor	1-3	3	3	3
	Vegetation on D/L walls	1-3	2	2	2
	Shape & aspect ratio of D/L cross-section	1-5	2	2	2
	Longitudinal morphology of D/L	1-4	2	2	2
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-4	2	2	2
	Shape of stream bordering flats/ slopes	1-5	4	4	4
	Nature of lateral flow regulation into D/L	1-5	3	3	3
	Sum of Scores		**19**	**19**	**19**
	Activity Score		**59**	**59**	**59**
	Classification		**Active**	**Active**	**Active**
LC8	Vegetation on D/L floor	1-3	2	2	2
	Vegetation on D/L walls	1-3	2	2	2
	Shape & aspect ratio of D/L cross-section	1-5	3	3	3
	Longitudinal morphology of D/L	1-4	3	3	3
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-4	2	2	2
	Shape of stream bordering flats/ slopes	1-5	4	4	4
	Nature of lateral flow regulation into D/L	1-5	4	4	4
	Sum of Scores		**21**	**21**	**21**
	Activity Score		**66**	**66**	**66**
	Classification		**Potentially Stabilising**	**Potentially Stabilising**	**Potentially Stabilising**

BSO CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Dec-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	MPR	MPR	MPR
LC9	Vegetation on D/L floor	1-3	3	3	3
	Vegetation on D/L walls	1-3	3	3	3
	Shape & aspect ratio of D/L cross-section	1-5	3	3	3
	Longitudinal morphology of D/L	1-4	2	2	2
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-4	2	2	2
	Shape of stream bordering flats/ slopes	1-5	4	4	4
	Nature of lateral flow regulation into D/L	1-5	4	4	4
	Sum of Scores		**22**	**22**	**22**
	Activity Score		**69**	**69**	**69**
	Classification		**Potentially Stabilising**	**Potentially Stabilising**	**Potentially Stabilising**
LC10	Vegetation on D/L floor	1-3	1	1	1
	Vegetation on D/L walls	1-3	1	1	1
	Shape & aspect ratio of D/L cross-section	1-5	2	2	2
	Longitudinal morphology of D/L	1-4	1	2	2
	Particle size of materials on foor	1-3	3	2	2
	Nature of D/L wall materials	1-4	4	4	4
	Shape of stream bordering flats/ slopes	1-5	4	4	4
	Nature of lateral flow regulation into D/L	1-5	4	4	4
	Sum of Ratings		**20**	**20**	**20**
	Activity Rating		**63**	**63**	**63**
	Classification		**Potentially Stabilising**	**Potentially Stabilising**	**Potentially Stabilising**

BSO CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Dec-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	MPR	MPR	MPR
LC11	Vegetation on D/L floor	1-3	N.A.	2	2
	Vegetation on D/L walls	1-3	N.A.	3	3
	Shape & aspect ratio of D/L cross-section	1-5	N.A.	3	3
	Longitudinal morphology of D/L	1-4	N.A.	3	3
	Particle size of materials on foor	1-3	N.A.	1	1
	Nature of D/L wall materials	1-4	N.A.	2	2
	Shape of stream bordering flats/ slopes	1-5	N.A.	3	3
	Nature of lateral flow regulation into D/L	1-5	N.A.	4	4
	Sum of Scores		N.A.	**21**	**21**
	Activity Score		N.A.	**66**	**66**
	Classification		N.A.	**Potentially Stabilising**	**Potentially Stabilising**
LC12	Vegetation on D/L floor	1-3	2	2	3
	Vegetation on D/L walls	1-3	2	2	2
	Shape & aspect ratio of D/L cross-section	1-5	3	3	3
	Longitudinal morphology of D/L	1-4	3	3	3
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-4	1	1	1
	Shape of stream bordering flats/ slopes	1-5	3	3	3
	Nature of lateral flow regulation into D/L	1-5	4	4	4
	Sum of Scores		**19**	**19**	**20**
	Activity Score		**59**	**59**	**63**
	Classification		**Active**	**Active**	**Potentially Stabilising**

MTW CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Nov-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	SLR	MPR	MPR
LC13	Vegetation on D/L floor	1-3	1	1	1
	Vegetation on D/L walls	1-3	2	2	2
	Shape & aspect ratio of D/L cross-section	1-3	3	3	3
	Longitudinal morphology of D/L	1-3	2	3	3
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-3	3	2	2
	Shape of stream bordering flats/ slopes	1-3	4	4	4
	Nature of lateral flow regulation into D/L	1-3	4	4	4
	Sum of Scores		**20**	**20**	**20**
	Activity Score		**63**	**63**	**63**
	Classification		**Potentially Stabilising**	**Potentially Stabilising**	**Potentially Stabilising**
LC14	Vegetation on D/L floor	1-3	2	2	3
	Vegetation on D/L walls	1-3	3	3	3
	Shape & aspect ratio of D/L cross-section	1-3	2	2	2
	Longitudinal morphology of D/L	1-3	2	2	2
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-3	1	1	1
	Shape of stream bordering flats/ slopes	1-3	4	4	4
	Nature of lateral flow regulation into D/L	1-3	4	4	4
	Sum of Scores		**19**	**19**	**20**
	Activity Score		**59**	**59**	**63**
	Classification		**Active**	**Active**	**Potentially Stabilising**

MTW CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Nov-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	SLR	MPR	MPR
LC15	Vegetation on D/L floor	1-3	1	1	1
	Vegetation on D/L walls	1-3	3	2	2
	Shape & aspect ratio of D/L cross-section	1-3	1	2	2
	Longitudinal morphology of D/L	1-3	2	2	2
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-3	1	1	1
	Shape of stream bordering flats/ slopes	1-3	4	4	4
	Nature of lateral flow regulation into D/L	1-3	4	4	4
	Sum of Scores		**17**	**17**	**17**
	Activity Score		**53**	**53**	**53**
	Classification		**Active**	**Active**	**Active**
LC16	Vegetation on D/L floor	1-3	1	1	1
	Vegetation on D/L walls	1-3	2	2	2
	Shape & aspect ratio of D/L cross-section	1-3	1	2	2
	Longitudinal morphology of D/L	1-3	2	2	2
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-3	1	1	2
	Shape of stream bordering flats/ slopes	1-3	4	4	4
	Nature of lateral flow regulation into D/L	1-3	4	4	4
	Sum of Scores		**16**	**17**	**18**
	Activity Score		**50**	**53**	**56**
	Classification		**Active**	**Active**	**Active**

MTW CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Nov-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	SLR	MPR	MPR
MTW LDP2	Vegetation on D/L floor	1-3			3
	Vegetation on D/L walls	1-3			2
	Shape & aspect ratio of D/L cross-section	1-3			3
	Longitudinal morphology of D/L	1-3			2
	Particle size of materials on foor	1-3			2
	Nature of D/L wall materials	1-3			2
	Shape of stream bordering flats/ slopes	1-3			4
	Nature of lateral flow regulation into D/L	1-3			4
	Sum of Scores				**22**
	Activity Score				**69**
	Classification				**Potentially Stabilising**
BM34	Vegetation on D/L floor	1-3	3	3	3
	Vegetation on D/L walls	1-3	3	3	3
	Shape & aspect ratio of D/L cross-section	1-5	5	5	5
	Longitudinal morphology of D/L	1-4	3	3	3
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-4	3	3	3
	Shape of stream bordering flats/ slopes	1-5	3	3	3
	Nature of lateral flow regulation into D/L	1-5	4	4	4
	Sum of Scores		**25**	**25**	**25**
	Activity Score		**78**	**78**	**78**
	Classification		**Stable**	**Stable**	**Stable**

MTW CSIRO Ephemeral Stream Assessment					
Site	**Date of Monitoring**		**Nov-22**	**Dec-23**	**Nov-24**
	Category Description	**Rating Range**	MPR	MPR	MPR
BM35	Vegetation on D/L floor	1-3	3	3	3
	Vegetation on D/L walls	1-3	2	2	2
	Shape & aspect ratio of D/L cross-section	1-5	2	2	2
	Longitudinal morphology of D/L	1-4	2	2	2
	Particle size of materials on foor	1-3	1	2	2
	Nature of D/L wall materials	1-4	2	2	2
	Shape of stream bordering flats/ slopes	1-5	3	3	3
	Nature of lateral flow regulation into D/L	1-5	3	3	3
	Sum of Scores		**18**	**19**	**19**
	Activity Score		**56**	**59**	**59**
	Classification		**Active**	**Active**	**Active**
BM37	Vegetation on D/L floor	1-3	1	2	2
	Vegetation on D/L walls	1-3	3	3	3
	Shape & aspect ratio of D/L cross-section	1-3	3	3	3
	Longitudinal morphology of D/L	1-3	4	4	4
	Particle size of materials on foor	1-3	1	1	1
	Nature of D/L wall materials	1-3	2	2	2
	Shape of stream bordering flats/ slopes	1-3	4	4	4
	Nature of lateral flow regulation into D/L	1-3	4	4	4
	Sum of Scores		**24**	**23**	**23**
	Activity Score		**73**	**72**	**72**
	Classification		**Stable**	**Stable**	**Stable**

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Appendix 6:

Annual Ground Water Review Report

Australasian Groundwater & Environmental Consultants

Report on

Mount Thorley Warkworth Annual Groundwater Monitoring Review 2024

Prepared for
Yancoal Australia Ltd

Project No. MTW5009.001
March 2025

ageconsultants.com.au

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Mount Thorley Warkworth
Annual Groundwater Monitoring Review 2024

1 Introduction

Yancoal Australia Ltd (Yancoal) operate the Mount Thorley and Warkworth Mines (MTW) as an amalgamated complex known as MTW, which is located 15 km south-west of Singleton in the Hunter Valley Region of NSW. The mine consists of two separate open cut mining pits operated and owned by Yancoal, accessing a series of coal seams within the Permian Wittingham Coal Measures.

Whilst MTW is operated in an amalgamated manner, the Mount Thorley and Warkworth Mines currently have separate conditions of approval issued by the NSW Department of Planning, Industry and Environment. The Development Consents for both mines (Warkworth: SSD-6464; Mount Thorley: SSD-6465) include conditions that require environmental monitoring data to be collected at each mine, with this data being reviewed and reported in an Annual Review document.

Yancoal have commissioned Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) to review groundwater monitoring data collected at MTW during 2024 and provide the results in an Annual Review.

1.1 Scope

This report is a review of groundwater monitoring data collected during the one-year monitoring period 1 January 2024 to 31 December 2024. AGE were commissioned by MTW to undertake the following scope of work:

- review alluvial and rock aquifer groundwater levels and quality;
- update relevant groundwater monitoring hydrographs;
- discuss how groundwater levels respond to rainfall and mining over the reporting period;
- discuss groundwater chemistry trend analyses;
- identify any changes/observations made during the past 12 months;
- identify exceedances of trigger criteria outlined in the approved the Water Management Plan (WMP; Water Management Plan Mount Thorley Warkworth version 5.1, dated 15 November 2021);
- assess the adequacy of the existing monitoring bore network and monitoring program; and
- provide recommendations if necessary.

2 Physical setting

2.1 Climate and rainfall

Long-term rainfall data covering the period 2007 – 2024 were obtained from MTWs Charlton Ridge weather station and are summarised in Table 2.1.

The total annual rainfall recorded at MTW for 2024 was 590 mm. April was the wettest month, with 131.2 mm of recorded rain, and December was the driest with 18.2 mm of rain recorded (Table 2.1). A comparison of the total annual 2024 rainfall (590 mm) at MTW with the longer-term 2007 to 2024 average (676.7 mm) illustrates a slightly below-average rainfall trend for the year.

Table 2.1 2024 rainfall data

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
MTW monthly Total rainfall (mm) 2024	38.2	62.6	25.4	131.2	81.6	53.8	25.4	32.6	39.4	38.8	42.8	18.2	590.0
MTW long-term monthly average rainfall (mm) 2007-2024	68.0	84.3	94.6	50.8	30.4	57.9	32.2	29.0	36.2	46.2	75.8	71.3	676.7

Historical rainfall was contextualised using the Cumulative Rainfall Departure (CRD) method (Figure 2.1). This method is a summation of the monthly departure of rainfall from the long-term average monthly rainfall. A rising trend in the CRD plot indicates periods of above average rainfall, whilst a falling slope indicates periods when rainfall is below average.

The CRD (Figure 2.1) displayed an increasing trend throughout 2020, 2021 and 2022, following drought conditions from early 2017 to late 2019. However, the CRD displayed a decreasing trend throughout 2023, reflective of the typically below-average rainfall experienced throughout the year. In 2024 the CRD saw an initially decreasing CRD trend followed by a sudden increasing trend mainly due to a significantly wet April. This trend began to even out and then decline through to the remainder of the year (Table 2.1; Figure 2.1).

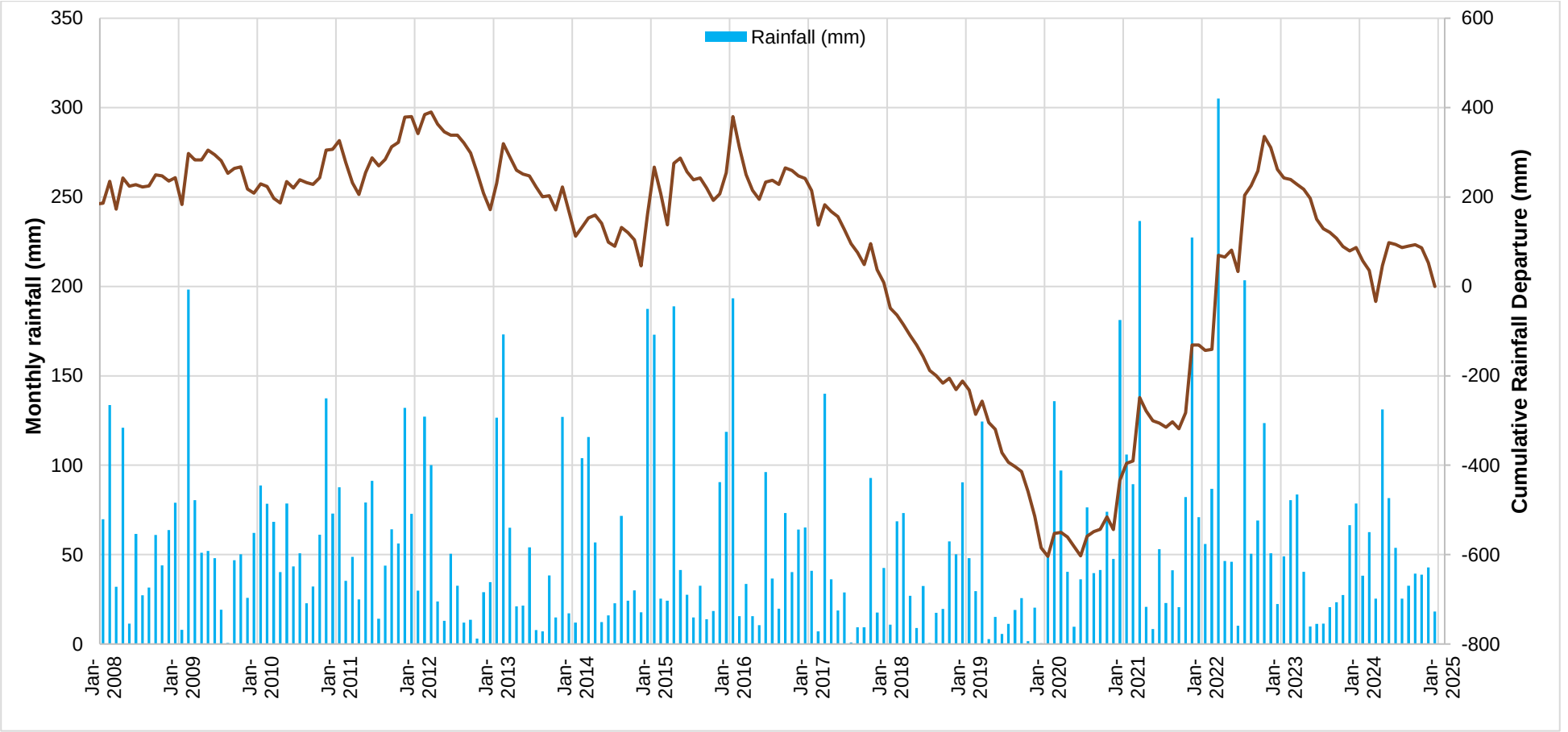


Figure 2.1 Cumulative rainfall departure (2007 to 2024) for MTW Charlton Ridge weather station

2.2 Surface water

MTW is bound by Wollombi Brook to the east and Hunter River to the north and north-east. Real time stream flow data was collected from Wollombi Brook at Warkworth (210004), Hunter River at Maison Dieu (210128) and Hunter River at Long Point (210134) from January 2016 to December 2024 (Figure 2.2).

Excepting short term fluctuations following heavy rainfall events, surface water levels remained steady at surface water monitoring stations on the Hunter River at Long Point, Maison Dieu and also in the station located in Wollombi Brook at Warkworth. Hunter River is regulated at Glenbawn Dam with daily releases to maintain flow and environmental quality. Wollombi Brook has held water since January 2020, following an extended period with no flow (period with no data on chart; Figure 2.2). A steading flow in Wollombi Brook contrasts the recent decreasing trends observed during 2023 and aligns with an uptick in the CRD trend during 2024. During 2024 Wollombi Brook saw a significant short-term increase in flow following large rain events during April and May, which quickly decreased through the remainder of the year.

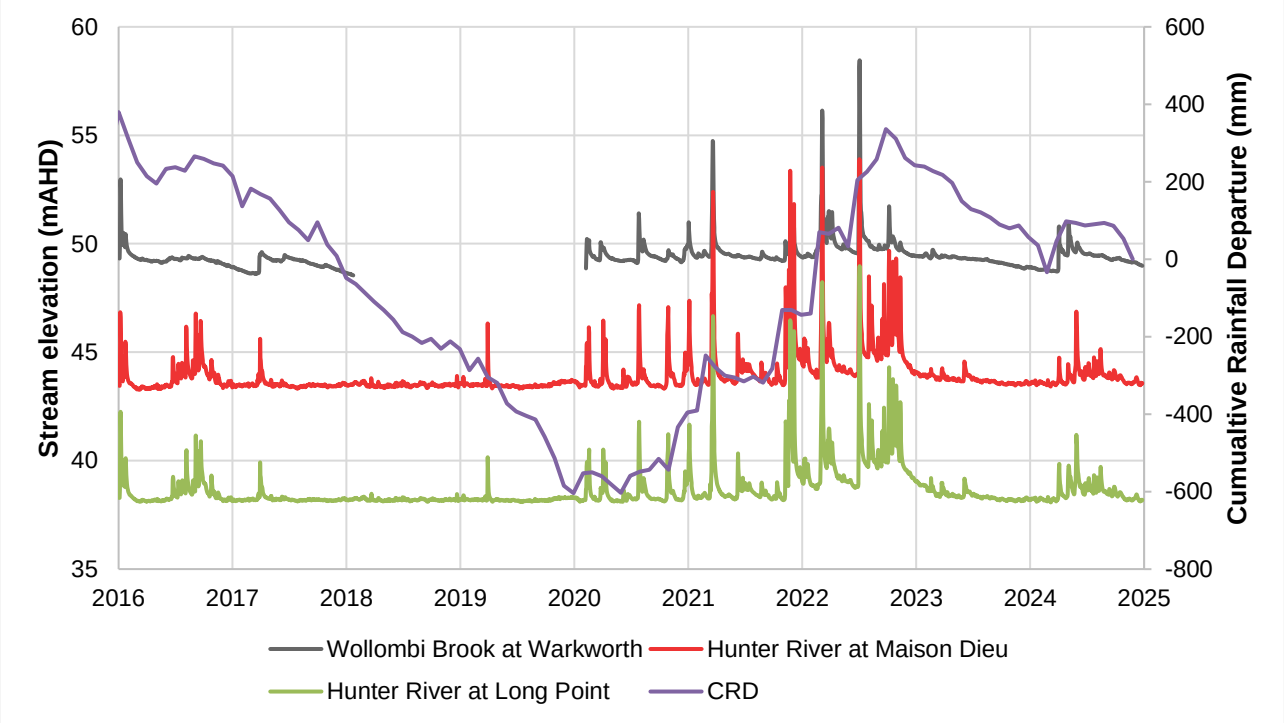


Figure 2.2 Surface water levels

2.3 Geology

MTW is located within the Hunter Coalfield in the Sydney Basin; a Permian-Triassic age sedimentary basin situated in the southern section of the Sydney-Gunnedah-Bowen Basin. The Sydney Basin's north-eastern extents are constrained by the New England Fold Belt and constrained by the Lachlan Fold Belt towards the south and west. The New England Fold Belt's periphery is distinguished by the Hunter-Mooki Thrust, defined by a progression of reverse faults alternated by mid-carboniferous rocks and Permian Sydney Basin strata.

The main stratigraphic units (Figure 2.3) occurring in the vicinity of the Project Area and the dominant lithology within each are:

- Quaternary alluvium– unconsolidated clays, silts, sands, and gravels mainly associated with Wollombi Brook to the west and Hunter River to the east of MTW;
- Warkworth sands – aeolian sand dunes unconformably overlying the Wittingham Coal Measures towards the northeast of the Project area; and
- Permian age Wittingham Coal Measures including the Jerry Plains and Vane sub-groups comprising multiple coal seams with intervening claystones, siltstones, sandstones, and conglomerates.

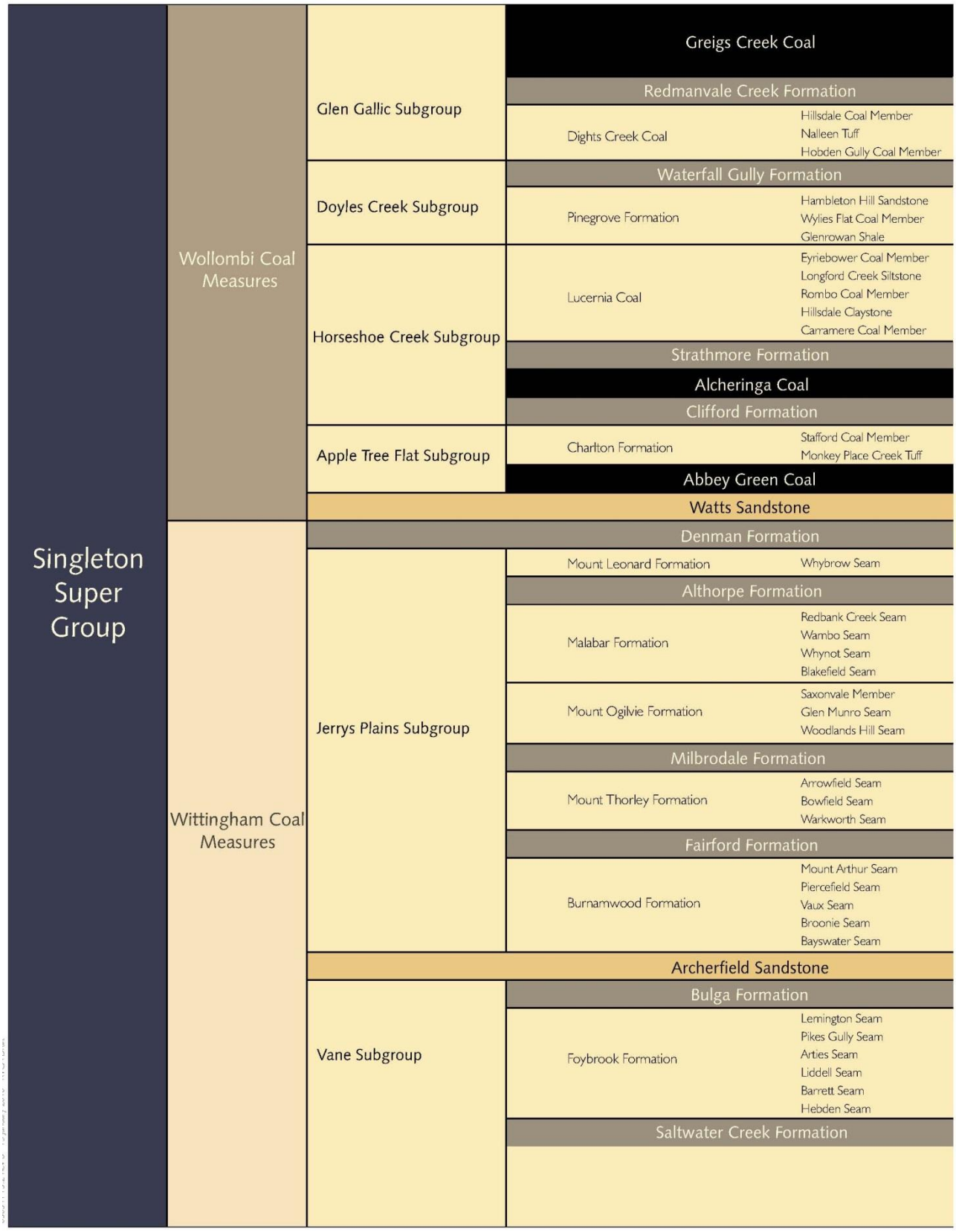


Figure 2.3 Stratigraphic column

3 Groundwater monitoring network

An updated WMP, for MTW, received approval 15 November 2021 (Yancoal 2021). The WMP contains a Groundwater Management Plan (Section 8 of the WMP), which outlines the groundwater monitoring network (Figure 3.1) and water quality triggers (Table 3.2).

The groundwater monitoring network comprises a total of 70 monitoring sites with 60 monitoring bores and 10 Vibrating Wire Piezometer (VWP) installations which require quarterly groundwater level, pH and Electrical Conductivity (EC) monitoring, and comprehensive annual lab analyses. Appendix A contains a list of the known details for each monitoring sites, as well as the monitoring plan reproduced from the WMP. The bores target alluvial aquifers (Wollombi Brook and Hunter River) as well as coal seams and interburden units within the Permian coal measures sequence. The coal seams currently mined at Warkworth Mine include the Redbank Creek, Wambo, Whynot, Blakefield, Glen Munro, Woodlands Hill, Arrowfield, Bowfield, Warkworth, and Mt Arthur Seams. Currently approved mining at Mt Thorley targets seams down to the Woodlands Hill.

VWP installations comprise pressure sensors grouted within each borehole and are used for monitoring of piezometric head.

Three bores were decommissioned during 2023: WOH2139A, MTD616P, and WD622P. Since 2023 two bores with blockages (OH1126 and MB15MTW11) were cleared for 2024 monitoring. Six bores had blockages or access issues during the 2024 monitoring period, these are detailed in Table 3.1 below.

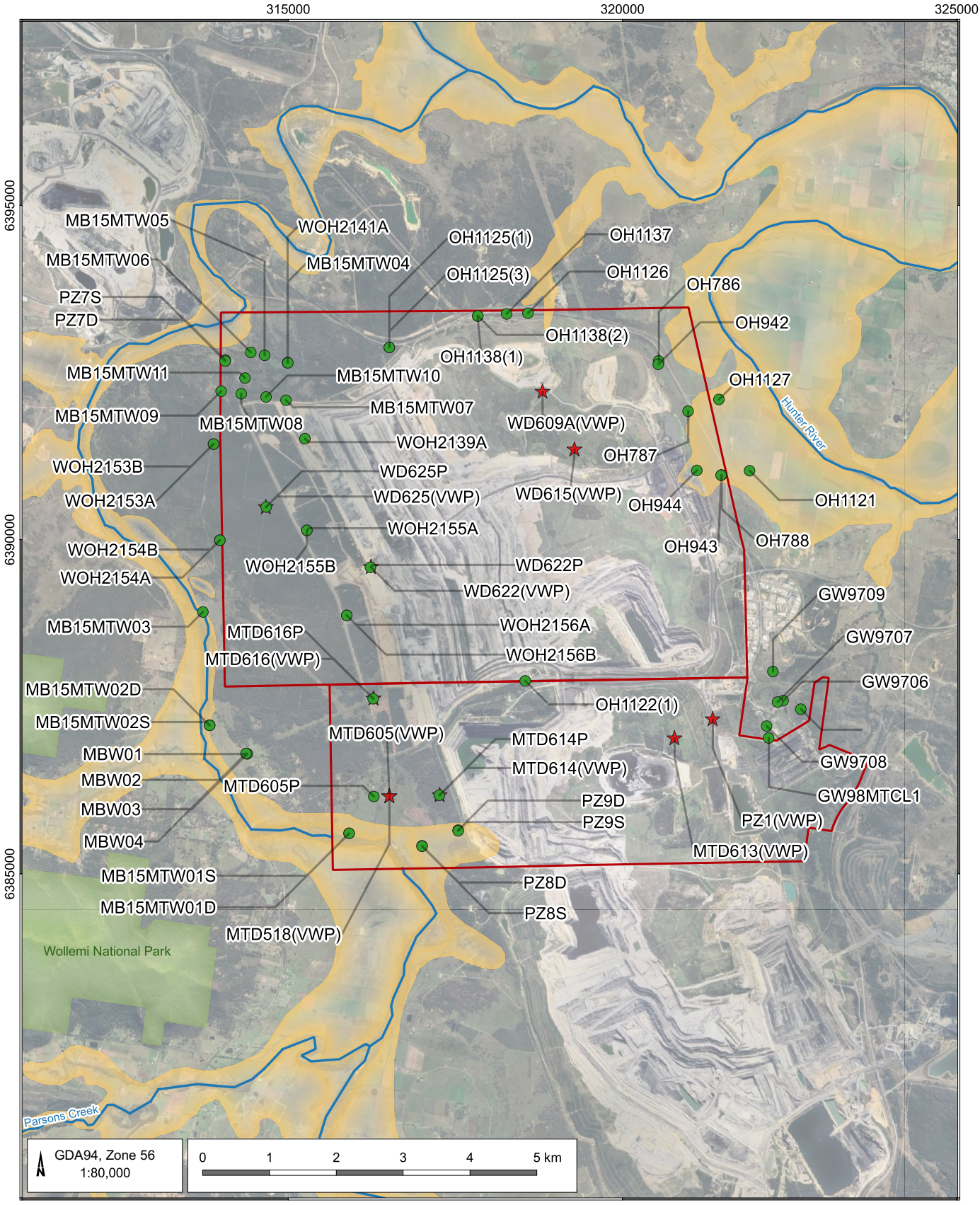
Table 3.1 Bore condition report – 2024

Bore ID	Comment(s) from field sheets[1]	Current status
OH1127	Blocked by pump stuck in bore	Blocked (Dec 2023)
OH1126	March 2023 field notes indicate the bore lid could not be removed. The bore lid was successfully opened following March monitoring. Obstruction / blockage at 1 m.	Cleared (January 2024)
MB15MTW11	Bore broken / collapsed (Nov 2023) readings taken after February 2024 are all dry, field notes do not make clear weather the blockage was cleared	Blocked (Nov 2023) Dry (May 2024)
OH943	Blockage in bore	Blocked (June 2024)
OH787	Inaccessible for monitoring in June for Q2 monitoring	Accessible
OH2154A	Site inaccessible during Q2 (May) and Q3 (August) Monitoring 2024	Accessible
OH2154B	Site inaccessible during Q2 (May) and Q3 (August) Monitoring 2024	Accessible
WD615 (VWP)	Site inaccessible – unable to locate bore, location (too overgrown)	Blocked (July 2024)

Note: 1AECOM Groundwater quality monitoring field sheets – 2024.

At each monitoring bore site, groundwater levels, EC and pH are measured in the field on a quarterly basis. A groundwater sample is also collected from each monitoring bore annually and analysed by an offsite laboratory for:

- total dissolved solids (TDS);
- major ions – Ca, Mg, Na, K, Cl, SO_4(or S);
- total alkalinity, bicarbonate alkalinity, carbonate alkalinity, hydroxide alkalinity; and
- trace elements - Al, As, B, Cd, Cu, Hg, Ni, Pb, Se, Zn (plus Mo, V and Cr for selected bores).



LEGEND

- Monitoring bore
- VWP
- MTW Leases
- Major water courses

MTW Annual Groundwater Review 2024
(MTW5009.001)

Groundwater monitoring network

AGE

DATE
04/02/2025

FIGURE No:
3.1

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Source: LiDAR DEM - © Department Finance, Services and Innovation.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
G:\Projects\MTW5008.001 MTW Annual Review 2023\3_GIS\Workspaces\001_MTW AGMR 2023\03.01_MTW5008.001_Groundwater monitoring network.qgz

3.1 Trigger values

The WMP outlines trigger values for groundwater EC and pH in Hunter River Alluvium, Wollombi Brook Alluvium, Aeolian Warkworth Sands, shallow overburden, and various coal seams. Trigger limits are applied to bores with a sufficient baseline dataset. The triggers apply and are calculated for groups of bores installed within the same geological unit and utilise percentiles of the available data to trigger further investigation. Three consecutive measurements falling outside the 5th and 95th percentile for pH triggers further investigation, whilst three consecutive results above the 95th percentile for EC require investigation. Groundwater quality triggers are summarised in Table 3.2.

The WMP provides a methodology to investigate samples that exceed the triggers for pH and EC. The WMP requires that '*in the event that a water quality measurement exceeds a predetermined trigger value, exceedances will be recorded and MTW will initiate a site-specific investigation if*':

- *professional judgement determines that the single deviation or a developing trend could result in environmental harm; or*
- *three consecutive measurements of EC or pH exceed trigger values.*

The investigation will:

- *determine the source and risk of impact on downstream water quality;*
- *determine the need for and extent of contingency measures;*
- *communicate outcomes to senior management; and*
- *be reported in the Annual Review.*

Whilst the WMP does not specify a trigger for groundwater levels it does require an annual review of '*depressurisation of coal measures and alluvium by a suitably qualified hydrogeologist*.'

Table 3.2 Groundwater quality trigger levels

Sample Point	Target Seam	Electrical Conductivity (µS/cm)	pH	
		95th	5th	95th
OH786	Hunter River Alluvium	1,551	6.9	7.7
OH787	Hunter River Alluvium	19,351	7.2	7.7
OH942	Hunter River Alluvium	25,400	6.5	6.8
OH943	Hunter River Alluvium	8,395	7.1	7.6
OH788	Hunter River Alluvium	13,480	6.9	7.9
PZ8S	Wollombi Brook Alluvium	15,190	6.5	7.0
PZ9S	Wollombi Brook Alluvium	16,197	6.8	7.0
PZ7S	Aeolian Warkworth Sands	1,747	6.7	7.5
GW9706	Bayswater	22,982	6.6	7.5
GW9707				
GW9708				
GW9709				
GW98MTCL1				
GW98MTCL2				
OH1127				
OH1125(3)	Bowfield Seam	14,600	6.6	6.9
OH1122(1)	Blakefield	14,825	6.6	8.0
WOH2139A				

Sample Point	Target Seam	Electrical Conductivity (µS/cm)	pH	
		95th	5th	95th
OH1125(1)				
WOH2153A	Redbank	15,482	7.0	7.9
WOH2154A				
WOH2155A				
WOH2156A				
MTD614P	Shallow Overburden	17,516	6.7	8.0
MTD616P				
MTD605P				
PZ7D				
MBW02				
MB15MTW01D				
MB15MTW02D				
MB15MTW03				
PZ8D				
PZ9D				
OH1137	Vaux	17,740	6.7	7.2
OH1126				
OH1121				
WD622P	Wambo	14,114	6.9	7.8
WOH2153B				
WOH2154B				
WOH2155B				
MBW04				
WOH2156B				
OH1138(2)	Warkworth	19,872	5.9	6.9
OH1138(1)				
WD625P	Woodlands Hill	12,483	6.9	7.3
WOH2141A	Whynot	10,689	7.5	7.8

3.2 Sampling methods

The WMP states that groundwater monitoring will be undertaken "*in accordance with AS 5667.1:-1998, Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples and AS 5667.11-1998, Guidance on Sampling of Groundwaters*".

A review of field sheet data indicate that quarterly groundwater samples were collected as grab samples or following purging in all bores. Limited information on purged volumes was made available, with three volumes of water purged prior to sampling where possible.

4 Water licensing

Groundwater licenses held for MTW are outlined in Table 4.1.

Table 4.1 Summary of licences held by MTW

Licence No.	DWE Reference	Share Component (ML)	Location/Purpose
10543	20AL201239	1009	Zone 2B: Hunter River from Wollombi Brook junction to Oakhampton Rail Bridge
963	20AL201242	243	Warkworth farm - Hunter River pump (Zone 2B)
971	20AL201258	270	Warkworth farm - Hunter River pump (Zone 2B)
1008	20AL201341	243	Warkworth farm - Hunter River pump (Zone 2B)
995	20AL201302	243	Anndale farm – Hunter River pump (Zone 2B)
1009	20AL201343	435	Anndale farm – Hunter River pump (Zone 2B)
19022	20AL209903	60	Sandy Hollow Creek (Unregulated river – Singleton Water Source)
18558	20AL208627	50	Lower Wollombi Brook Water Source
18469	20AL20858	245	Lower Wollombi Brook Water Source
40464	20AL218784	180	Mt Thorley Excavation; North Coast Fractured and Porous Rock Groundwater Sources
40465	20AL218785	750	Warkworth Excavation; North Coast Fractured and Porous Rock Groundwater Sources

Note: Water licence details obtained from the approved WMP (15 November 2021).

5 Groundwater monitoring results

Groundwater level measurements provided by Yancoal were used to prepare hydrographs for each monitoring point. The groundwater levels were also plotted along with the CRD to determine if trends in water levels were related to climatic factors or other influences. The CRD shows monthly rainfall trends compared with long term averages. An increase trend in the CRD indicates periods of above average rainfall, whilst a declining trend indicates below average rainfall. Where recharge occurs from rainfall, groundwater levels are often correlated with the CRD. This comparison can be used to 'screen out' climatic trends and determine where other factors such as mining are influencing groundwater levels.

Appendix C contains the hydrographs generated for each bore and compared to modelled predictions. The hydrographs include long term data preceding the 2024 reporting year to ensure long term trends are identified and considered. Appendix B contains groundwater level hydrographs with the bores grouped according to geological unit. These figures also show the pH and EC measured for each bore (with a trigger applied) to allow water levels and water quality trends to be compared and determine if they are interrelated.

The groundwater level trends observed within the monitoring network depend on the location and geological units screened and long-term trends can therefore be grouped into:

- Western down-dip depressurisation zone – monitoring bores in Permian coal measures to the west and 'down-dip' of the mining area that are recording depressurisation due to mining operations, as predicted by groundwater modelling.
- Eastern up-dip coal measures and alluvium – bores to the east of the mining area within Hunter River alluvium and Bayswater coal seam that are 'up-dip' of mining and are responding only to climatic influences.
- Wollombi Brook alluvium – bores within the Wollombi Brook alluvium that have a varied response, suggesting localised impact where mining is close to the flood plain and no impact where mining is more distant.
- Warkworth Sands – bores within the perched aquifer of the Warkworth Sands, which is located in elevated areas, generally do not respond to mining.

The sections below discuss water level and quality trends within each of these zones. Samples collected that exceeded the nominated triggers values are also discussed.

5.1 Western down-dip depressurisation zone

A number of numerical models to simulate groundwater flow at MTW have been developed (within EIS reports from 2002, 2009 and 2014). The most recent update to the model was conducted by AGE (2015) which updated the model developed for the 2014 EIS. All numerical models developed have consistently predicted mining will depressurise groundwater within the coal measures down-dip and west of the mining area. The models predict the zone of depressurised Permian bedrock will extend under the Wollombi Brook alluvium, but the alluvium water level will be largely unaffected. Groundwater monitoring generally confirms this conclusion with a general loss of water pressure and level occurring in many of the monitoring sites installed within Permian bedrock to the west of the mining area.

The measured decline in water levels is not as uniform as predicted by groundwater modelling due to heterogeneities within the groundwater systems. The sections below discuss the water level and quality data collected from the bores grouped together for trigger levels. Water level and quality graphs for each group of bores are included within Appendix B.

5.1.1 Redbank Creek coal seam bores

There are four bores (WOH2153A, WOH2154A, WOH2155A and WOH2156A) within this group located west and down-dip of the mine (Figure B 1). The data for these bores indicate:

- A long-term declining trend in groundwater levels as predicted by groundwater modelling.
- Groundwater levels steadily declined at all bores throughout 2024.
- Groundwater pH was typically stable in Redbank Creek coal seam bores during the 2024 monitoring period. Values for WOH2153A were recorded at the higher prescribed threshold for all monitoring periods other than quarter 1 (February) which was within threshold limits. WOH2156A recorded values at the lower threshold for all recording periods except quarter 1 (February) which was within threshold limits. WOH2155A recorded a reading the same as the lower threshold during quarter 1 but improved and remained stable through the remainder of the year.
- Groundwater EC values, recorded in Redbank Creek coal seams bores, increased slightly at WOH2156A and remained steady at WOH2155A, WOH2153A and WOH2154A, during the 2024 monitoring period. All EC values were below the established trigger criteria during the monitoring period.

5.1.2 Wambo coal seam bores

There are six bores (WD622P, WOH2153B, WOH2154B, WOH2155B, WOH2156B and MBW04) within the Wambo coal seam group, west and down-dip of the mine (Figure B 2). The data for these bores indicate:

- A long-term declining trend in groundwater levels in WD622P. The remaining Wambo coal seam bores are relatively stable.
- Bore WD622P was decommissioned in early 2023; therefore, no data is available from this bore as of February 2023.
- Excepting WOH2156B, groundwater levels in the Wambo coal seam bores were typically stable throughout 2024. Highly variable water levels were recorded at WOH2156B. Groundwater elevation declined rapidly between Q4 2023 and Q1 2024 and recovered rapidly throughout Q2 and Q3. This was followed by a further decline in groundwater elevation in Q4.
- The groundwater pH in WOH2156B declined rapidly during Q1 and remained below the lower trigger level during the following three monitoring periods, triggering the exceedance protocol. This period of record is coincident with the unstable water level data recorded within this borehole during 2024. The remaining Wambo coal seam monitoring bores fluctuated within the trigger range throughout 2024.
- Excepting MBW04, groundwater EC values recorded in Wambo coal seam bores in 2024 were relatively stable or declining slightly. Groundwater EC in MBW04 increased sharply during between Q1 and Q2 (February to May) and slightly declined through the remainder of the year. Groundwater EC in WOH2153B remained stable with a very slight increasing trend throughout 2024.

5.1.3 Blakefield coal seam bores

There are three bores (OH1122(1), OH1125(1) and WOH2139A) within this group, downdip of the Warkworth mining area (Figure B 3). The data indicate:

- No data is available from WOH2139A due to the bore having been decommissioned in early-2023. Monitoring bore OH1122(1) went dry during 2023. Due to this, no water level or quality data is available for these bores for 2024. This leaves OH1125 (1) as the only monitoring bore that is still providing data for the Blakefield coal seam bores.
- OH1125 (1) groundwater elevation remained relatively stable throughout 2024, increasing slightly throughout Q2 and Q3 and declining slightly during Q4.
- Groundwater pH in OH1125(1) fluctuated within the trigger range throughout the 2024 monitoring period. No pH trigger exceedances were recorded during the 2024 monitoring period, with fluctuations attributed to natural variation.
- Groundwater EC in OH1125(1) was relatively stable throughout 2024. There were no EC exceedances recorded in Blakefield coal seam monitoring bores during the 2024 monitoring period.

5.1.4 Bowfield coal seam bores

There is one bore (OH1125(3)) installed within this group to the north of Warkworth mine (Figure B 4). The data for this bore indicate:

- Long-term groundwater levels in OH1125(3) indicate a declining trend in groundwater level.
- OH1125(3) was consistently dry throughout 2024, for this reason, there are no water quality data available for the 2024 period.

5.1.5 Whynot coal seam bores

There is one monitoring bore (WOH2141A) installed within this group to the north of Warkworth mine (Figure B 5). The data for this bore indicate:

- Long-term data show a declining groundwater level in WOH2141A. This decline in groundwater level aligns with modelled predictions.
- Groundwater levels in Whynot coal seam bore WOH2141A declined during the 2024 monitoring period. The water levels steadily declined from 46 mAHD to 45 mAHD over the course of the 2024 monitoring period.
- Groundwater pH in WOH2141A increased in Q2 and remained stable at 7.7 through the remainder of the 2024 monitoring period. No pH trigger exceedances were recorded during the 2024 monitoring period.
- Groundwater EC values in WOH2141A had no discernible trend throughout 2024. No exceedances were recorded in 2024.

5.1.6 Woodlands Hill coal seam bore

There is one monitoring bore (WD625P) installed within the Woodlands Hill coal seam to the west of MTW (Figure B 6). The data for this bore indicate:

- Long-term gradually declining trend in groundwater level.
- Groundwater level had a slow and steadily declining trend throughout 2024.
- Groundwater pH values were typically stable (7.1) with a slight increase (7.2) observed in May and August. No pH trigger exceedances were recorded throughout the year.
- Groundwater EC in WD625P fluctuated during the 2024 monitoring period within the exceedance thresholds.

5.1.7 Shallow overburden underlying Wollombi Brook alluvium bores

There are six bores installed within shallow overburden material underlying the Wollombi Brook alluvium (PZ8D, PZ9D, MB15MTW01D, MB15MTW02D and MB15MTW03) and Warkworth Sands (PZ7D) to the west of the Warkworth and Mt Thorley mines (Figure B 7 and Figure B 8). The bores are paired with shallow bores monitoring the overlying alluvial and aeolian sediments. The data for these bores indicate:

- Long-term groundwater level data indicate that shallow overburden monitoring bores underlying Wollombi Brook alluvium and Warkworth Sands exhibit a delayed response to rainfall recharge.
- Groundwater level in shallow overburden monitoring bores underlying the Wollombi Brook alluvium and Warkworth Sands remained relatively stable throughout the 2024 monitoring period. PZ7D was the only bore to display a slight declining groundwater level trend.
- The pH values in monitoring bores underlying the Wollombi Brook alluvium and Warkworth Sands were generally stable in 2024. Several bores recorded slight increases or decreases in pH during the May or August monitoring rounds. MB15MTW01D pH has been consistently observed below the 5th percentile trigger criteria since November 2018. Continued pH exceedances MB15MTW01D were investigated by AGE (2022) and concluded that inappropriate trigger values were the likely cause of the exceedances. No other pH exceedances were recorded during 2024.
- Groundwater EC in shallow overburden monitoring bores underlying Wollombi Brook alluvium and Warkworth Sands were typically stable during the 2024 monitoring period. No EC exceedances were recorded during 2024.

5.1.8 Shallow overburden bores

There are four bores (MBW02, MTD614P, MTD605P and MTD616P) installed within the shallow overburden to the west of MTW, and east of the Wollombi Brook alluvium (Figure B 7 and Figure B 8). The data for these bores indicate:

- MTD616P was decommissioned between During quarter 2 of 2023; therefore, no data is available for the 2024 monitoring period.
- Long-term groundwater level data indicate stable groundwater levels in shallow overburden monitoring bores east of the Wollombi Brook alluvium.
- Groundwater levels in shallow overburden bores east of Wollombi Brook alluvium were typically stable during the 2024 monitoring period.
- pH values in shallow overburden monitoring bores were typically stable during the 2024 monitoring period. All bores recorded slight fluctuations during the 2024 monitoring period. No groundwater pH exceedances were recorded during 2024.
- EC values in shallow overburden bores were generally stable during the 2024 monitoring period. EC values at monitoring bore MTD605P have historically been recorded at values higher than the EC trigger value, with the most recent exceedance occurring in November 2023, however this bore remained slightly below its derived trigger level (17,516 µS/cm) during the 2024 monitoring period.

5.2 Eastern up-dip coal measures and alluvium

A network of monitoring bores is present to the east of the MTW mining area. This network includes bores screened within the Hunter River alluvium and also bores screened within the Bayswater seam underlying the alluvium. The sections below discuss the monitoring results for each of these bores.

5.2.1 Hunter River alluvium bores

There are six bores (OH786, OH787, OH788, OH942, OH943 and OH944) located to the east of the Warkworth mining area screened within the Hunter River alluvium (Figure B 9 through Figure B 14). The monitoring data for these bores indicate:

- OH787 was not accessible during Q2 of 2024; therefore, water level and quality data for this bore are only available for Q1, Q3 and Q4.
- Excepting OH786 in which groundwater level has fluctuated, long-term groundwater levels in Hunter River alluvial monitoring bores have been mostly stable.
- Groundwater levels in Hunter River alluvial bores were stable or decreased slightly during the 2024 monitoring period; the exception being OH786 which recorded fluctuating groundwater levels. OH942 remained stable for the first half of the monitoring period before showing a relatively rapid increasing trend in groundwater level for the remaining two quarters. Monitoring bore OH944 was dry throughout the 2024 monitoring period, this bore has been dry since 2016. OH943 was dry during Q1 and became blocked for the remainder of the monitoring period. Therefore, no groundwater level or water quality, data was recorded throughout 2024 for these two bores.
- pH values in Hunter River alluvial monitoring bores remained relatively stable during 2024. Groundwater pH levels in all bores showed a slight increase during the first two quarters before decreasing to previous levels except OH787 which remained stable at 7.5. No groundwater pH exceedances were recorded during 2024.
- Groundwater EC in Hunter River alluvial bores were mostly stable during the 2024 monitoring period. Increases in EC were observed in OH787 and OH788 (approximately 2,000 to 3000 µS/cm) during the first quarter followed by a similarly sized decrease in EC during Q2 and Q3. A slight EC increase was observed in all of these bores during Q4. OH786 displayed a rising trend in groundwater EC throughout 2024 but remained beneath its trigger threshold. No EC exceedances were recorded in these bores during 2024.

5.2.2 Bayswater coal seam bores

The Bayswater seam is the basal coal seam within the Jerry's Plains subgroup. Mining at MTW does not remove the Bayswater seam, and therefore it is representative of the 'under-burden' bedrock sequence within the pit floor. There are seven bores (GW9706, GW9707, GW9708, GW9709, GW98MTCL1, GW98MTCL2 and OH1127) within the Bayswater group (Figure B 15), with the monitoring data indicating:

- OH1127 has remained blocked since Q1 2023 and therefore has no water level (or quality) data for the 2024 period.
- Long-term groundwater levels are stable within Bayswater coal seam monitoring bores.
- Groundwater levels in Bayswater coal seam monitoring bores were typically stable during the 2024 monitoring period. Excepting boreholes GW98MTCL1 and GW9709, which remained relatively stable throughout 2024, groundwater levels in all bores showed a marginal increase through Q1 and Q2 and then a marginal decrease through Q3 and Q4.
- Groundwater pH values varied in Bayswater coal seam monitoring bores during the monitoring period. GW98MTCL2 recorded a pH value the same as the lower trigger threshold (6.6) during December 2024, having recorded a stable value of 6.7 during the three preceding quarters of the monitoring period. No groundwater pH exceedances were recorded during 2024.
- Groundwater EC values in Bayswater coal seam bores all showed slightly decreasing trends in 2024. Bores GW9707, GW9709 recorded an EC increase during Q1 which was followed by a decreasing EC trend during Q2 and Q3, increasing slightly thereafter. Bores GW9708 and GW98MTCL1 also recorded a similar, albeit muted, trend. Remaining Bayswater coal seam bores GW98MTCL2 and GW9706 recorded typically stable EC during the monitoring period. No groundwater EC exceedances were recorded in 2024.

5.2.3 Warkworth coal seam bores

There are two nested bores (OH1138(1) and OH1138(2)) within this group located to the north of Warkworth Mine (Figure B 16). The data for these bores indicate:

- Long-term groundwater levels in Warkworth coal seam bores correlate to the CRD trend, indicating a lagged response to rainfall.
- Groundwater levels in Warkworth coal seam monitoring bores declined throughout the 2024 monitoring period. Groundwater levels marginally declined (approximately 0.3 m) at OH1138(1). At OH1138(2) a sharp increase in water level occurred during January 2024 which was followed by a sudden decrease in February, this pattern could likely be explained by a delayed response to the period of heavy rainfall during late 2022. A steady decrease (0.44 m) in groundwater elevation was recorded at OH1138(2) throughout the remainder of 2024.
- Groundwater pH values remained relatively steady in Warkworth coal seam bores throughout the 2024 monitoring period. Values for pH in OH1138(1) remained relatively stable, fluctuating between 6.1 and 6.2 during the 2024 monitoring period, recording one reading of 6.0 in February. Values of pH observed in OH1138(2) remained stable at 6.6 the entire 2024 monitoring period, except for a single reading of 6.5 in February. No observed pH values exceeded the trigger criteria in 2024.
- Groundwater EC values in Warkworth coal seam monitoring bores fluctuated slightly in 2024. EC in both OH1138(1) and OH1138(2) increased during the beginning of 2024 and declined during the middle of the year. This was followed by a steady increase in EC throughout the remainder of the year. A single reading (20,000 µS/cm) above groundwater EC trigger thresholds (19872 µS/cm) was recorded in OH1138(1) during April 2024. All previous and subsequent readings from this bore during the 2024 monitoring period remained slightly below the trigger threshold.

5.2.4 Vaux coal seam bores

There are three bores (OH1121, OH1126 and OH1137) installed within the Vaux seam group that surround the Warkworth Mine to the north and east (Figure B 17). The data for these bores indicate:

- Bore OH1126 was previously inaccessible due to a damaged bore lid and a subsequent bore obstruction; therefore, no 2023 water level (or quality) data was collected during this period This blockage was cleared on 17/01/24 and samples were able to be taken for the entire 2024 monitoring period.
- Groundwater elevation in Vaux coal seam monitoring bores were stable or declined slightly in 2024. Water levels at OH1121 and OH1137 were generally stable, recording a very slight decline throughout the monitoring period. OH1126 recorded a slightly steeper, steadily declining trend in groundwater elevation.
- Groundwater pH in Vaux coal seam monitoring bores recorded variable trends throughout the 2024 monitoring period. Groundwater pH triggers were exceeded twice in OH1126 and once in OH1137 during 2024. No samples were able to be taken from OH1126 during the previous year (2023). Following bore maintenance, recorded pH levels in OH1126 during Q1 and Q2 (6.6) were beneath the lower trigger threshold (6.7), which is consistent with the previous measurement in December 2022. Values for pH in this bore has since increased to 6.7 (within trigger limits). OH1137 had one reading in Q2 the same as the upper trigger threshold (7.2) and another reading above the upper threshold during Q4 (7.3). OH1121 remained steady at 7.0 throughout 2024 except for Q3 which saw the pH reading temporarily fluctuate to the value of the upper trigger threshold.
- Groundwater EC values in Vaux coal seam monitoring bores varied in 2024. groundwater EC values in OH1121 remained mostly stable during 2024 with only minor fluctuations. Groundwater EC values in OH1137 remained mostly stable with a slightly increasing overall trend for the year. OH1126 also remained mostly stable except for a slight increase in EC during Q2 before a gradual decreasing trend through the remainder of the year. No groundwater EC exceedances were recorded.

5.3 Wollombi Brook alluvium bores

Two bores (PZ8S and PZ9S) are installed within the Wollombi Brook alluvium. The bores are in proximity to the Mt Thorley Mine Loders Pit, where the Wollombi Brook alluvium encroaches on this location (Figure B 18 and Figure B 19). The data for these bores indicate:

- Long-term trends indicate that Wollombi Brook alluvial groundwater levels strongly correlate with climatic trends.
- Groundwater levels in the Wollombi Brook alluvium declined throughout the 2024 monitoring period, correlating strongly with the CRD trend.
- Groundwater pH in PZ8S increased during Q1 (March) and remained stable thereafter, before decreasing in December. Groundwater pH values observed in PZ9S were all at or above the upper trigger threshold limit, recording two readings of 7.2 during Q2 and Q3 and two readings of 7.0 during Q1 and Q4. Only two consecutive groundwater pH readings were recorded outside trigger thresholds indicating no exceedances occurred.
- Groundwater EC in PZ8S remained relatively stable (approximately 13,200 µS/cm) throughout the 2024 monitoring period. EC in PZ9S fluctuated sharply throughout 2024, declining between Q1 and Q2 before sharply increasing again between Q2 and Q4, 2024. No EC exceedances were recorded in Wollombi Brook Alluvium bores during the 2024 monitoring period.

5.4 Warkworth Sands bore

A single monitoring bore (PZ7S) is installed at the foot-slopes of the Warkworth Sands Woodland (Figure B 20). The dataset for this bore indicate:

- Long-term groundwater level data indicate PZ7S is weakly correlated with climatic conditions.
- Groundwater level in PZ7S steadily decreased during the 2024 monitoring period, correlating closely with CRD trends.

- 2024 groundwater pH recordings in PZ7S began at the lower trigger threshold during Q1 and rose slightly during the following three quarters. No observed pH values exceeded the trigger criteria in 2024.
- Groundwater EC in PZ7S remained relatively stable during the 2024 monitoring period and slightly decreased during Q4. No groundwater EC exceedances were recorded in 2024.

5.5 Additional bores

Groundwater level, pH and EC trends in monitoring bores outlined in the WMP but without water quality trigger values are outlined in this section.

5.5.1 Wollombi Brook alluvium bores

Three additional monitoring bores (MB15MTW01S, MB15MTW02S and MBW01) are installed into the Wollombi Brook alluvium (Figure B 21). Data in these bores has been collected since August 2017. No trigger values are established for these bores. The data indicate:

- Long-term groundwater levels correlate with the CRD.
- Groundwater levels at Wollombi Brook alluvium monitoring bores MB15MTW01S, MB15MTW02S sharply increased between Q1 and Q2 before gradually decreasing during the remainder of the 2024 monitoring period. MBW01 showed a consistent gradually decreasing trend for the duration of 2024.
- Groundwater pH in Wollombi Brook alluvial monitoring bores remained relatively stable throughout the 2024 monitoring period. Groundwater pH at MBW01 and MB15MTW01S remained steady before slightly dropping in Q4 (November). MB15MTW02S had stable pH during Q1 and Q2, increased slightly in Q3, before decreasing in Q4.
- Groundwater EC varied in the additional Wollombi Brook alluvium bores during 2024. MBW01 showed a decreasing trend between Q1 and Q3 before increasing sharply at the end of the year. MB15MTW01S remained relatively stable but had a very slight decreasing trend during the 2024 monitoring period. MB15MTW02S displayed a decreasing EC trend between Q1 and Q2, before gradually increasing throughout the remainder of the 2024 monitoring period.

5.5.2 Warkworth Sands bores

Eight additional monitoring bores (MB15MTW04, MB15MTW05, MB15MTW06, MB15MTW07, MB15MTW08, MB15MTW09, MB15MTW10 and MB15MTW11) are installed into the Warkworth Sands (Figure B 22). No bore survey or construction details were made available. Therefore, groundwater level is shown as mTOC (top of casing) not water level mAHD. The dataset for these bores indicate:

- Warkworth Sands monitoring bores MB15MTW04, MB15MTW05, MB15MTW07, MB15MTW08, MB15MTW10 and MB15MTW11 were dry throughout 2024 and therefore have no water level (or quality) data available.
- Groundwater levels in MB15MTW06, increased between Q1 and Q2 monitoring before gradually decreasing through the remainder of the year. During the 2024 monitoring period a single water level reading was able to be taken for MB15MTW09 in Q3 (August) however there was insufficient water available to take pH or EC samples.
- Groundwater pH in Warkworth Sands monitoring bores 2024 monitoring period were only able to be obtained from MB15MTW06. Groundwater pH in MB15MTW06 rose between Q1 and Q2 sampling, before declining through the remainder of the 2024 monitoring period.
- Groundwater EC values in Warkworth Sands bores were only able to be obtained from a single borehole from the group (MB15MTW06) during the 2024 monitoring period. EC in MB15MTW06 remained relatively stable through the 2024 monitoring period. No groundwater EC exceedances were recorded in 2024.

5.5.3 Whybrow coal seam bores

A single monitoring bore (MBW03) is installed in the Whybrow coal seam (Figure B 23). No groundwater quality triggers are assigned to this bore. The dataset indicate the following:

- Long-term groundwater levels appear to correlate with climatic conditions.
- Groundwater level remained consistent through 2024 (approximately 55 mAHD).
- Groundwater pH values in MBW03 initially declined (6.9) during the period between Q4 2023 and Q1 2024, before increasing between Q2 and Q3, wdecling again in Q4.
- Groundwater EC values were initially very low (approximately 720 µS/cm) before sharply increasing between Q1 and Q2 (8830 µS/cm). EC continued to gradually increase thereafter.

5.5.4 MBW6A

No survey coordinates or bore construction details are available for MBW6A (Figure B 24). Groundwater level and EC data has been recorded consistently since September 2017. The dataset indicate:

- Long-term groundwater level trend decreased until November 2019, increasing gradually thereafter.
- Groundwater levels initially rose between Q1 and Q2 and then declined during the remainder of the 2024 monitoring period.
- Groundwater pH in MBW6A was relatively stable during the 2024 monitoring period.
- Groundwater EC initially decreased for Q1 and Q2 before increasing for the remainder of the 2024 monitoring period.

5.6 VWP pressure heads

VWP pressure head data collected during the 2024 monitoring period was combined with historic data and the figures are presented in Appendix D. The following observations can be noted for 2024:

- VWP pressure head in WD609A sensor at 110 m (spoil) (Figure D 1) decreased steadily during the 2024 monitoring period. The sensor read null values during the middle of 2024, recording slightly declining pressure head data from September onwards.
- VWP data for WD615 has been unavailable since January 2022 (Figure D 2). Historically, pressure head in the sensor at 133 m (Piercefield) has been stable since 2019 and pressure head in the sensor at 255 m, installed into the Bayswater coal seam, has been increasing gradually since September 2018, following a declining trend since 2013. Pressure head in the deeper Bayswater seam was initially higher than the shallower Piercefield seam indicating that an upward hydraulic gradient was present in the Bayswater seam before depressurisation due to mining.
- Excepting the sensor at 217 m (Woodlands Hill), VWP pressure heads in WD625 (Figure D 3) steadily declined throughout the 2024 monitoring period. The sensor at 217 m was relatively stable throughout the reporting period, fluctuating around 29 mAHD.
- No data was available for VWP WD622 during the 2024 monitoring period (Figure D 4). Historically, pressure heads at each of the five sensors at WD622 have been relatively stable.
- No data was available for VWP MTD616 (Figure D 5). Historically, pressure heads have typically decreased at all sensors; except the sensor at 42 m (Whybrow), at which pressure head has increased since 2016.
- During the 2024 monitoring period, pressure head in MTD613 sensor at 384 m (Broonie/Bayswater) displayed an accelerating declining trend aligning with data from other sensors placed in the Bayswater seam. This observation is the inverse of that noted during the 2023 monitoring period, in which an increasing pressure head trend was observed in the Broonie and Bayswater seams (Figure D 6).
- Pressure heads in MTD605 (Figure D 7) remained typically stable throughout 2024. Pressure readings from sensors at 58 m (Overburden), 100 m (Whybrow seam) and 215 m (Blakefield seam) remained relatively steady. The remaining three sensors all showed a slight declining trend. The VWP sensor at 502 m (Bayswater) has a higher pressure head than the shallower sensors at 215 m (Blakefield) and 368 m (Mt Arthur). This indicates an upward hydraulic gradient in the deeper seam at this location. No data has been available for the Vaux seam sensor since 2019 however during January 2024 the sensor began to record readings again, which seem consistent with the previous data collected by this sensor.

- Pressure heads in sensors at 64 m (Whybrow) and 191 m (Glen Munro) in MTD614 (Figure D 8) showed varying trends during the 2024 monitoring period. The sensor at 64 m showed an increasing trend during the beginning of 2024 and began to decline through the remainder of 2024. The sensor at 191 m changed from a decreasing trend in pressure head to an increasing trend throughout 2024. No data, or erroneous data, has been recorded in the sensor at 383 m (Vaux) since June 2016. Data from sensors at 342 m (Mt Arthur) and 453 m (Bowfield) have been erroneous since they were installed. This is likely due to the sensors being damaged during the installation process. Periodically, data is recorded in these sensors, however, the pressure readings fluctuate significantly between each reading.
- Pressure heads in VWP MTD518 (Figure D 9) declined slightly in 2024. Data from sensors at 142.5 m (Mt Arthur) and 226.5 m (Blakefield/Woodlands Hill) also recorded a very slight decline in pressure head. Data from the sensor at 358 m (Wambo) was highly erroneous, likely indicating the sensor had failed.
- PZ1 calibration factors weren't available. Calibration factors should be located so that PZ1 can be reviewed in the next Annual Review.

6 Model verification

Observed groundwater level data and numerical groundwater model predictions (AGE, 2015) have been graphed in Appendix C. Review of the data indicate that observed groundwater level trends generally correlate with 2024 modelled predictions. However, at multiple monitoring locations observed and modelled groundwater levels don't align, these are discussed below:

- Observed groundwater levels in Redbank seam monitoring bores have trended downward since 2011. The observed downward trend is more rapid than model predictions, particularly in WOH2153A and WOH2154A in which modelled groundwater levels are generally stable.
- Observed groundwater levels in Wambo seam monitoring bores are slightly lower than predictions. The exceptions being WOH2155B in which observed data indicate relatively stable groundwater levels in recent years, with the model predicting a sightly declining groundwater level trend WOH2156B also displays a relatively stable groundwater level in comparison to the model predictions; however, during late 2023 and throughout 2024 the data has begun to show a higher degree of variability, with significant decliner recorded in 2024.
- Observed groundwater levels in WOH2139A (Blakefield seam) have been trending downward since 2011, correlating closely with modelled predictions. Predicted groundwater levels in the remaining Blakefield coal seam bores are significantly lower than observed levels. This is especially evident in OH1122(1) in which observed groundwater levels are >35 m higher than model predictions.
- A weak correlation between observed and predicted groundwater level trends in Bowfield monitoring bore OH1125(3) is evident. Observed data show a fluctuating groundwater level, whilst modelled predictions indicate a gradually declining groundwater level from 2015 to 2022, after which groundwater level stabilises. This borehole has remained dry since March 2023.
- Observed level data in Warkworth seam bores OH1138(1) and OH1138(2) are strongly correlated with model predictions until 2023. Predicted groundwater levels continue to decline throughout 2023; however, observed in both bores data increased initially (in response to 2022 rainfall), before stabilising. As of 2024 OH1138(1) and OH1138(2) are trending downward as predicted by the model. Observed groundwater levels in OH1138(2) are higher than predicted levels.
- Excepting OH1121, in which observed groundwater levels have consistently been below modelled predictions, observed groundwater levels in Vaux seam monitoring bores are above predictions. OH1126 has recorded decreasing groundwater levels from 2016 to 2021, stabilising during 2022 before increasing throughout 2023. Following a gap in sampling during 2023 (bore blockage) a declining trend was observed during 2024 monitoring.
- Observed groundwater level in shallow overburden monitoring bores correlate strongly with predictions, excepting PZ8D and PZ9D. PZ8D correlated with predicted levels strongly up to late 2022, when observed levels remained relatively stable throughout 2024, in contrast to decreasing predicted levels. PZ9D has remained relatively stable since 2016, despite modelled levels gradually declining.
- Similar to the modelled predictions, groundwater level in Hunter River alluvial bores have remained stable in recent years. Observed levels are typically lower than predictions.
- Observed groundwater levels in Bayswater coal seam bores generally align with predicted levels. The exceptions are GW9709, in which observed groundwater levels are below predictions; GW98MTCL2, in which observed groundwater levels are higher than model predictions (>10 m); or OH1127, in which observed groundwater levels are below prediction (approximately 10 m).
- Groundwater levels in Wollombi Brook alluvium monitoring bores, except PZ9S, strongly correlate with predictions. Observed groundwater levels at PZ9S were typically stable throughout 2022 to 2024; however, modelled groundwater levels gradually declined during this period.
- Observed groundwater levels in Warkworth Sands bore PZ7S are approximately 5 m lower than predicted.
- Observed pressure heads in VWP WD625 vary compared to modelled predictions. Pressure head in sensor 1 (217 mBGL) has been gradually declining in recent years compared to a more rapid predicted decline. Pressure head measured in sensor 3 (375 mBGL), although stable, is lower than predicted (approximately 10 m).

- Pressure heads recorded in VWP WD622 vary compared to modelled predictions. Pressure heads in sensor 1 (54 mBGL) and sensor 4 (334 mBGL) correlate closely with recent predictions. Data from sensor 2 (165 mBGL) and sensor 3 (314 mBGL) indicate stable pressure heads, whilst the model predicts declining pressure heads at those depths. Pressure head in sensor 5 (408 mBGL) is significantly lower than predictions in recent years (>60 m). It should be noted that this dataset is incomplete and this borehole and sensor data from this station has been intermittent since 2015.
- Observed pressure heads in VWP MTD605 typically align with the pressure head trend predicted by the model, although pressure heads are lower than those predicted. The exception being sensor 4 (215 mBGL), in which observed pressure heads are greater than predicted.
- Observed pressure heads in VWP MTD614 vary considerably to modelled predictions. Observed pressure head in sensor 1 (64 mBGL) is higher than predictions (approximately 20 m), whilst sensor 2 (191 mBGL) is lower (approximately 20 m). No data is available for the remaining sensors likely due to faults in the sensors.
- Pressure heads observed in VWP MTD518 sensors 2 (226.5 mBGL) and sensor 3 (142.5 mBGL) show a trend typically similar to modelled predictions, although observations are lower than those predicted. Observed pressure head in sensor 1 (358 mBGL) is erroneous, so comparison to modelled predictions cannot be determined.
- Observed pressure head trend in VWP WD615 sensor 1 (133 mBGL) correlate closely to predictions. Predicted pressure heads in sensor 2 (225 mBGL) are stable. The model overpredicts pressure head in sensor 2 by up to 120 m. No data has been submitted for WD615 since early 2022, field sheets indicate the location of the monitoring station has been lost due to overgrowth.

7 Summary

A summary of the findings of this report are as follows:

- Groundwater level in coal seams in the Western down-dip depressurised zone generally declined or remained stable during the 2024 monitoring period.
- Groundwater levels in shallow overburden monitoring bores underlying the Wollombi Brook alluvium and Warkworth Sands typically declined or remained stable during the 2024 monitoring period. Minimal interaction between the Wollombi Brook alluvium and the shallow overburden is evident.
- Groundwater level in coal seams eastward and up-dip of mining recorded variable results during 2024. Bayswater monitoring bores were typically stable, whilst groundwater levels in Vaux and Warkworth coal seam bores decreased during the monitoring period.
- Groundwater level in Hunter River alluvial bores were stable or slightly increased during 2024. Boreholes OH942 and OH788, saw a notable, rapid increase in water level during the last two quarters of 2024. The exceptions were OH786, which recorded continuing fluctuating groundwater levels and OH787, which recorded stable water levels during 2024.
- Groundwater level in Wollombi Brook alluvium monitoring bores first increased and then decreased during the year. Groundwater levels in all Wollombi Brook alluvium monitoring bores correlate strongly with the CRD, indicating no mining related impacts.
- Groundwater level in Warkworth Sands monitoring bore PZ7S steadily declined during the 2024 monitoring period, correlating closely with CRD trends.
- Multiple pH trigger exceedances were recorded in the shallow overburden monitoring bore MB15MTW01D in 2024. The four consecutive trigger exceedances in MB15MTW01D (in February, May, August and November) indicate an exceedance and relate to the lower pH trigger level (6.9). Previous exceedances for pH in MB15MTW01D were investigated (AGE, 2022) and concluded that inappropriate trigger values were the likely cause of the exceedances.
- Exceedances for pH were recorded in the WOH2156B monitoring the Wambo seam. Trigger values below the lower trigger threshold of 6.9 were observed during all four monitoring periods of 2024 (in February, May, August and November).
- A single trigger exceedance for pH (7.3) was recorded during Q4 at borehole OH1137 (monitoring the Vaux seam), exceeding the higher trigger value of 7.2. pH observations collected during the previous three monitoring periods of 2024 were within trigger thresholds.
- Two consecutive trigger values for pH were recorded in borehole PZ9S (monitoring the Wollombi Brook Alluvium) during Q2 and Q3 monitoring (June and October). pH readings for Q1 and Q4 (March and December) were both equal to the upper trigger level of 7.0.
- 2024 groundwater pH measurements in PZ7S were below the lower trigger threshold during Q1 and Q2. The pH reading increased during Q3 monitoring, but again exceeded the lower trigger threshold during Q4 monitoring.
- Hunter River Monitoring bore OH787 recorded a single reading above the trigger threshold for groundwater EC during Q1 (March). This reading of 19,400 µS/cm was only marginally above the trigger threshold 19351 µS/cm.
- Warkworth seam monitoring bore OH1138(1) recorded one groundwater EC reading in April that was above trigger thresholds in 2024. Previous and subsequent readings during 2024 all remained below the trigger threshold.
- VWP sensors installed into the Bayswater coal seam recorded declining results during the 2024 monitoring period. Sensors in WD625 and MTD605 recorded declining pressure heads throughout the year and pressure heads in MTD613 began to show a heavily declining trend during 2024; which is the reversal of that noted during the 2023 reporting period. No pressure head data was available for VWPs MTD616, WD622 and WD615 for the 2024 period.
- VWP pressure head in sensors installed into the Mt Arthur coal seam slightly declined during the 2024 monitoring period. The exception being sensors in MTD616 and MTD615, for which there are no data for the monitoring period.
- Sensors installed into Woodlands Hill coal seam recorded decreasing pressure heads during 2024.

- There were no VWP data available from sensors in the Wambo coal seam for 2024. Data from the sensor installed into the Wambo coal seam at VWP MTD518 indicates the sensor has likely failed.
- Pressure head declined in VWP sensors in the Vaux coal seam for 2024 (MTD605, MTD616 and WD625). The sensor in the Vaux seam in bore MTD605 had not been reading since 2019 but began to record data at the beginning of 2024.
- Whybrow coal seam VWP sensor pressure heads remained relatively stable during the 2024 monitoring period; no data from borehole MTD616 was available this period.
- VWP pressure heads in the Glen Munro seam (at MTD614) showed a slightly increasing trend during 2024.
- VWP pressure heads in the Blakefield seam (at MTD605) were stable during 2024.
- VWP pressure heads in the Piercefield seam (at WD615) were stable during 2024.
- PZ1 calibration factors weren't available. Calibration factors should be located so that PZ1 can be reviewed in future reports.
- Observed groundwater level trends generally correlate with modelled predictions. The exceptions being Blakefield seam bore OH1122(1) in which observed groundwater levels are >35 m higher than model predictions, a weak correlation between modelled and observed level data in Bowfield seam monitoring bores, and GW98MTCL2 which exhibits disparity between observed data and modelled data in excess of 10 m. WOH2156B displays a relatively stable groundwater level in comparison to modelled predictions, but since late 2023 has begun to show a higher degree of variability when compared to the model, exhibiting significant decline in 2024. Typically, observed pressure heads in VWPs do not strongly align with modelled predictions. There are no modelled data for bores constructed after 2015.
- It is assumed that the following bores have been decommissioned: WOH2139A, MTD616P, and WD622P

8 Recommendations

Based on the findings of this report the following recommendations have been made:

- An investigation should be undertaken to determine the cause of pH exceedances in WOH2156B.
- Calibration factors for VWP PZ1 should be determined so that pressure head trends can be discussed in future annual reviews.
- Mount Arthur, Bowfield and Vaux seam VWP sensor cables should be inspected in MTD614 for damage to determine if erroneous data is due to a poor connection to the logger.
- Vaux seam sensor in MTD605 and Wambo seam sensor in MTD518 should be inspected for damage to determine if missing (MTD605) and erroneous (MTD518) data is due to a poor connection to the logger.
- Undertake remediation actions at OH1127 (blocked by pump), MB15MTW11 (confirm bore is blocked); and WD615 should be relocated (logger unit is apparently overgrown and cannot be located).
- Survey data (coordinates and top of PVC mAHD) should be obtained for bores MB15MTW01 through MB15MTW11, and MBW06A.
- Consider installing a new monitoring bore to monitor the Bowfield seam. The last remaining monitoring bore for this section OH1125(3) went dry during 2022.
- Consider updating the groundwater model to incorporate newly constructed monitoring installations and to better model existing monitoring installations.

9 References

Australasian Groundwater & Environmental Consultants Pty Ltd (AGE). (2015). *Mount Thorley and Warkworth Mines, Long Term Approvals Model Update*. Submitted February 2015.

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Appendix A

Summary of groundwater monitoring program

Table A 1 Summary of 2023 groundwater monitoring program

Sample Point	Easting	Northing	ToC RL (mAHD)	Bore depth (m)	Target Seam	Water Level	EC	pH	Comprehensive Analysis
OH786	320542	6392674	55.7	7.1	Hunter River Alluvium	Q	Q	Q	A
OH787	320982	6391921	50	12.1	Hunter River Alluvium	Q	Q	Q	NA[4]
OH788	321482	6390967	45.4	22.1	Hunter River Alluvium	Q	Q[1]	Q[1]	A
OH942	320536	6392622	55.8	13.2	Hunter River Alluvium	Q	Q	Q	A*
OH943	321476	6390963	45	9.9	Hunter River Alluvium	Q	Q	Q	NA[6]
OH944	321113	6391035	47.9	8.2	Hunter River Alluvium	Q	-	-	NA
OH1121	321902	6391030	45.6	20.3	Vaux	Q	Q	Q	A
OH1122 (1)	318545	6387886	100.6	49.6	Blakefield	Q	-	-	NA
OH1125 (1)	316511	6392875	86.2	40	Blakefield	Q	Q	Q	A*
OH1125 (3)	316511	6392875	86.2	62.7	Bowfield Seam	M	-	-	NA
OH1126	318586	6393387	64.5	52.5	Vaux	-	-	-	A
OH1127	321444	6392097	51.2	29	Bayswater	-	-	-	NA[3]
OH1137	318266	6393377	67.9	17.8	Vaux	Q	Q	Q	A
OH1138 (1)	317835	6393346	70.7	24.8	Warkworth	M	M	M	A
OH1138 (2)	317835	6393346	70.7	42.8	Warkworth	M	M	M	A
WOH2139A	315249	6391511	91.7	96	Blakefield	-	-	-	Decommissioned
WOH2153A	313881	6391429	68.3	42.6	Redbank	Q	Q	Q	A
WOH2153B	313881	6391429	68.3	62.4	Wambo	Q	Q	Q	A
WOH2154A	313976	6389990	68.9	69.4	Redbank	Q	Q	Q	NA[1]
WOH2154B	313976	6389990	68.9	98	Wambo	Q	Q	Q	NA[1]
WOH2155A	315278	6390138	74.6	46	Redbank	Q	Q	Q	A
WOH2155B	315278	6390138	74.6	73.1	Wambo	Q	Q	Q	A

Sample Point	Easting	Northing	ToC RL (mAHD)	Bore depth (m)	Target Seam	Water Level	EC	pH	Comprehensive Analysis
WOH2156A	315874	6388866	80.4	31.5	Redbank	Q	Q	Q	A
WOH2156B	315874	6388866	80.4	80.1	Wambo	Q	Q	Q	A
WOH2141A	314989	6392647	91.6	45.6	Whynot	Q	Q	Q	A
PZ7D	314057	6392684	58.4	30.5	Shallow overburden	Q	Q	Q	A
PZ7S	314055	6392671	58.4	11.1	Aeolian Warkworth Sands	Q	Q	Q	A
PZ8D	317001	6385418	65.8	37	Shallow overburden	Q	Q	Q	A
PZ8S	317002	6385411	65.8	-	Wollombi Brook Alluvium	Q	Q	Q	A
PZ9D	317541	6385652	65.5	24	Shallow overburden	Q	Q	Q	A
PZ9S	317542	6385642	65.4	6.9	Wollombi Brook Alluvium	Q	Q	Q	A
GW9706	322404	6387589	64.2	21.2	Bayswater	Q	Q	Q	A
GW9707	322319	6387569	63.9	21	Bayswater	Q	Q	Q	A
GW9708	322158	6387209	73.1	29.6	Bayswater	Q	Q	Q	A
GW9709	322251	6388026	60.3	21	Bayswater	Q	Q	Q	A
GW98MTCL1	322188	6387032	77.8	19.7	Bayswater	Q	Q	Q	A
GW98MTCL2	322669	6387462	79.5	27.6	Bayswater	Q	Q	Q	A
PZ1 (VWP)	321350	6387310	72.1	41 42	Mt Arthur (Shallow) Mt Arthur (Deep)	Q	-	-	-
WD609A (VWP)	318803	63922	129.9	110	Spoil	Q	-	-	-
WD615 (VWP)	319281	6391347	160	133 225	Piercefield Bayswater	ND	-	-	-
WD625 (VWP)	314663	6390483	76.4	217 354 375	Woodlands Hill Mt Arthur Vaux	Q	-	-	-

Sample Point	Easting	Northing	ToC RL (mAHD)	Bore depth (m)	Target Seam	Water Level	EC	pH	Comprehensive Analysis
				441	Bayswater				
WD625P	314669	6390487	76.4	31	Woodlands Hill	Q	Q	Q	A
WD622 (VWP)	316236	6389588	84.5	54	Wambo	ND	-	-	-
				165	Woodlands Hill				
				314	Mt Arthur				
				334	Vaux				
				408	Bayswater				
WD622P	316229	6389585	84.5	55	Wambo	Q1	Q1	Q1	Decommissioned
MTD616 (VWP)	316274	6387621	77.7	42	Whybrow	ND	-	-	-
				109	Wambo				
				215	Woodlands Hill				
				343	Mt Arthur				
				378	Vaux				
				446	Bayswater				
MTD616P	316269	6387618	77.8	29	Shallow overburden	Q1	Q1	Q1	Decommissioned
MTD613 (VWP)	320778	6387025	150.5	384	Broonie/Bayswater	Q	-	-	-
MTD605 (VWP)	316512	6386159	77.1	58	Overburden	Q	-	-	-
				100	Whybrow				
				149	Interburden				
				215	Blakefield				
				368	Mt Arthur				
				429	Vaux				
				502	Bayswater				

Sample Point	Easting	Northing	ToC RL (mAHD)	Bore depth (m)	Target Seam	Water Level	EC	pH	Comprehensive Analysis
MTD605P	316279	6386156	77.4	42	Shallow overburden	Q	Q	Q	A
MTD614 (VWP)	317265	6386174	72.4	64	Whybrow	Q	-	-	-
				191	Glen Munro				
				342	Mt Arthur				
				383	Vaux				
				453	Bowfield				
MTD614P	317259	6386175	72.6	30	Shallow overburden	Q	Q	Q	A
MTD518 (VWP)	316512	6386156	80	142.5	Mt Arthur	Q	-	-	-
				226.5	Blakefield/Woodlands Hill				
				358	Wambo				
MB15MTW01S	315909	6385605	-	-	Wollombi Brook Alluvium	Q	Q	Q	A
MB15MTW01D	315910	6385604	-	-	Shallow overburden	Q	Q	Q	A
MB15MTW02S	313823	6387224	-	-	Wollombi Brook Alluvium	Q	Q	Q	A
MB15MTW02D	313823	6387219	-	-	Shallow overburden	Q	Q	Q	A
MB15MTW03	313722	6388917	-	22.7	Shallow overburden	Q	Q	Q	A
MB15MTW04	314993	6392645	-	6.5	Warkworth Sands	Q	Q	Q	NA
MB15MTW05	314645	6392758	-	6.9	Warkworth Sands	Q	Q	Q	NA
MB15MTW06	314438	6392801	-	6.9	Warkworth Sands	Q	Q	Q	A
MB15MTW07	314965	6392085	-	6.8	Warkworth Sands	Q	Q	Q	NA
MB15MTW08	314296	6392182	-	6.8	Warkworth Sands	Q	Q	Q	NA
MB15MTW09	313995	6392219	-	3.1	Warkworth Sands	Q	Q	Q	NA
MB15MTW10	314667	6392134	-	3.7	Warkworth Sands	Q	Q	Q	NA
MB15MTW11	314352	6392417	-	6.9	Warkworth Sands	Q	Q	Q	NA[2]

Sample Point	Easting	Northing	ToC RL (mAHD)	Bore depth (m)	Target Seam	Water Level	EC	pH	Comprehensive Analysis
MBW01	314379	6386796	62.4	11	Wollombi Brook Alluvium	Q	Q	Q	A
MBW02	314373	6386798	62.6	60.4	Shallow overburden	Q	Q	Q	A
MBW03	314387	6386794	62.4	84.2	Whybrow seam	Q	Q	Q	A
MBW04	314368	6386800	62.4	162	Wambo	Q	Q	Q	A
MBW6A	-	-	-	-	-	Q	Q	Q	A

Notes: ToC RL: top of casing reference elevation.

VWP: vibrating wire piezometer.

Q: quarterly.

A: annual.

M: monthly.

Comprehensive analysis includes major ions TDS, Al, As, B, Ca, Cd, Cl, (CO3), Cu, Hg, K, Mg, Na, Ni, Pb, Se, SO4 (or S), Zn, Total Alkalinity, Bicarbonate Alkalinity, Carbonate Alkalinity, Hydroxide Alkalinity.

* Comprehensive analysis also includes Mo, V, and Cr.

NA: not applicable – bore dry/ insufficient water.

[1] No access during Q3 and Q4.

[2] Monument damaged 2023 and repaired during Q1 and dry for remainder of 2024.

[3] Obstruction – no data during 2024.

[4] Inaccessible during Q2 – no sample taken for comprehensive analysis.

[5] Insufficient water to sample during Q3; bore broken/collapsed during Q4.

[6] Bore dry in Q1 and blocked for remainder of 2024

Appendix B

Groundwater level and quality graphs

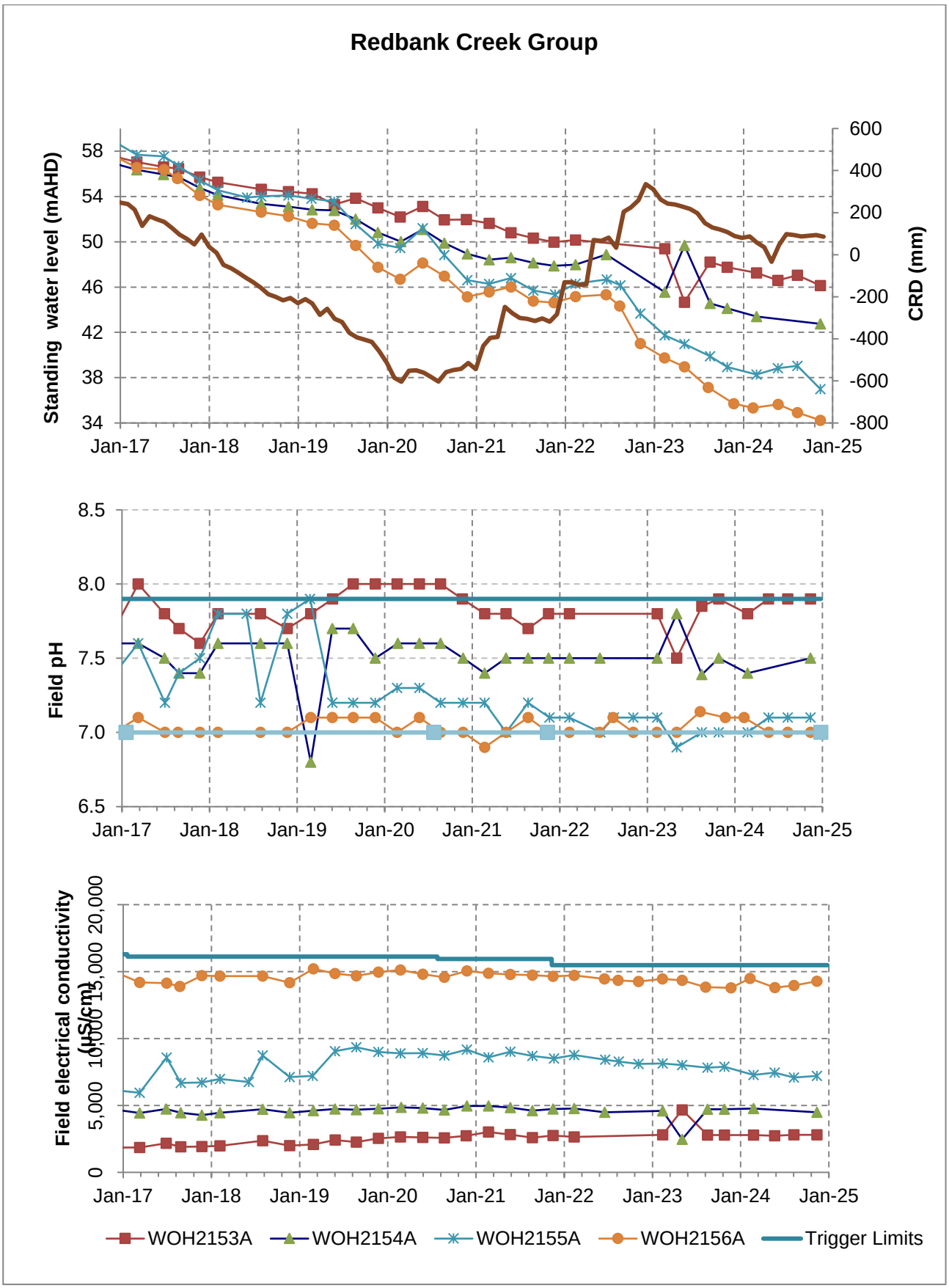


Figure B 1 Redbank Creek seam bores GWL, pH, and EC

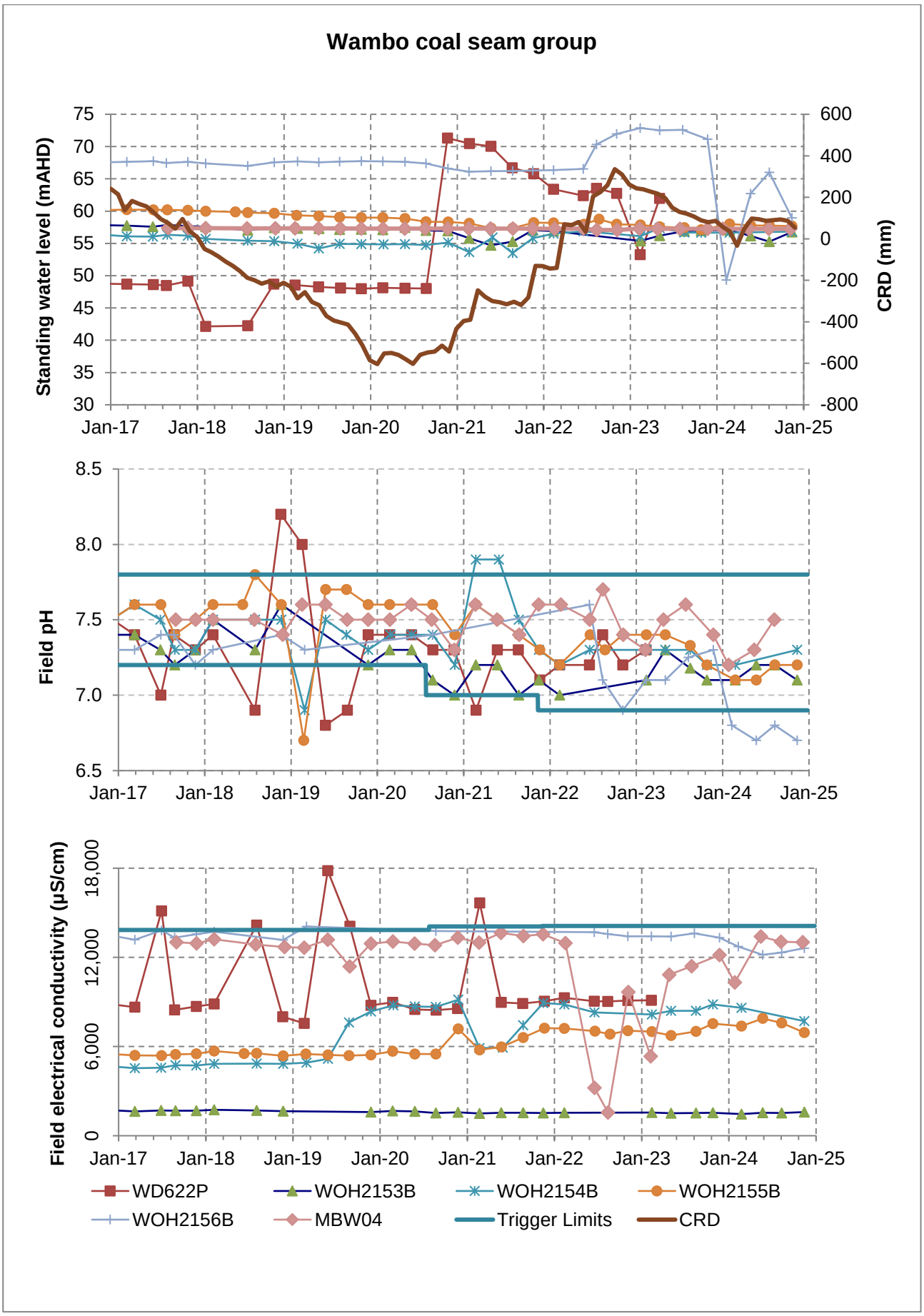


Figure B 2 Wambo coal seam bores GWL, pH, and EC

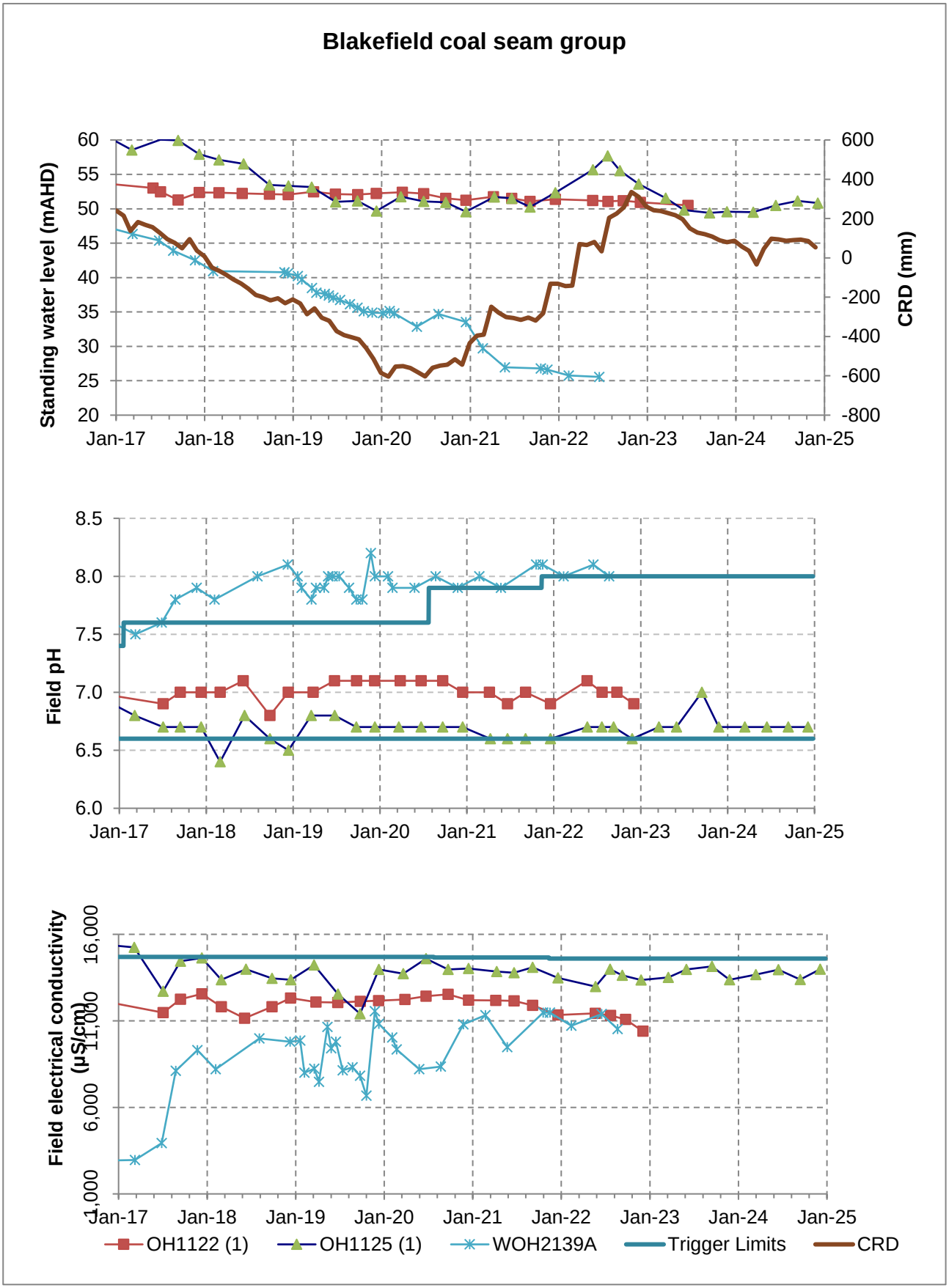


Figure B 3 Blakefield coal seam bores GWL, pH, and EC

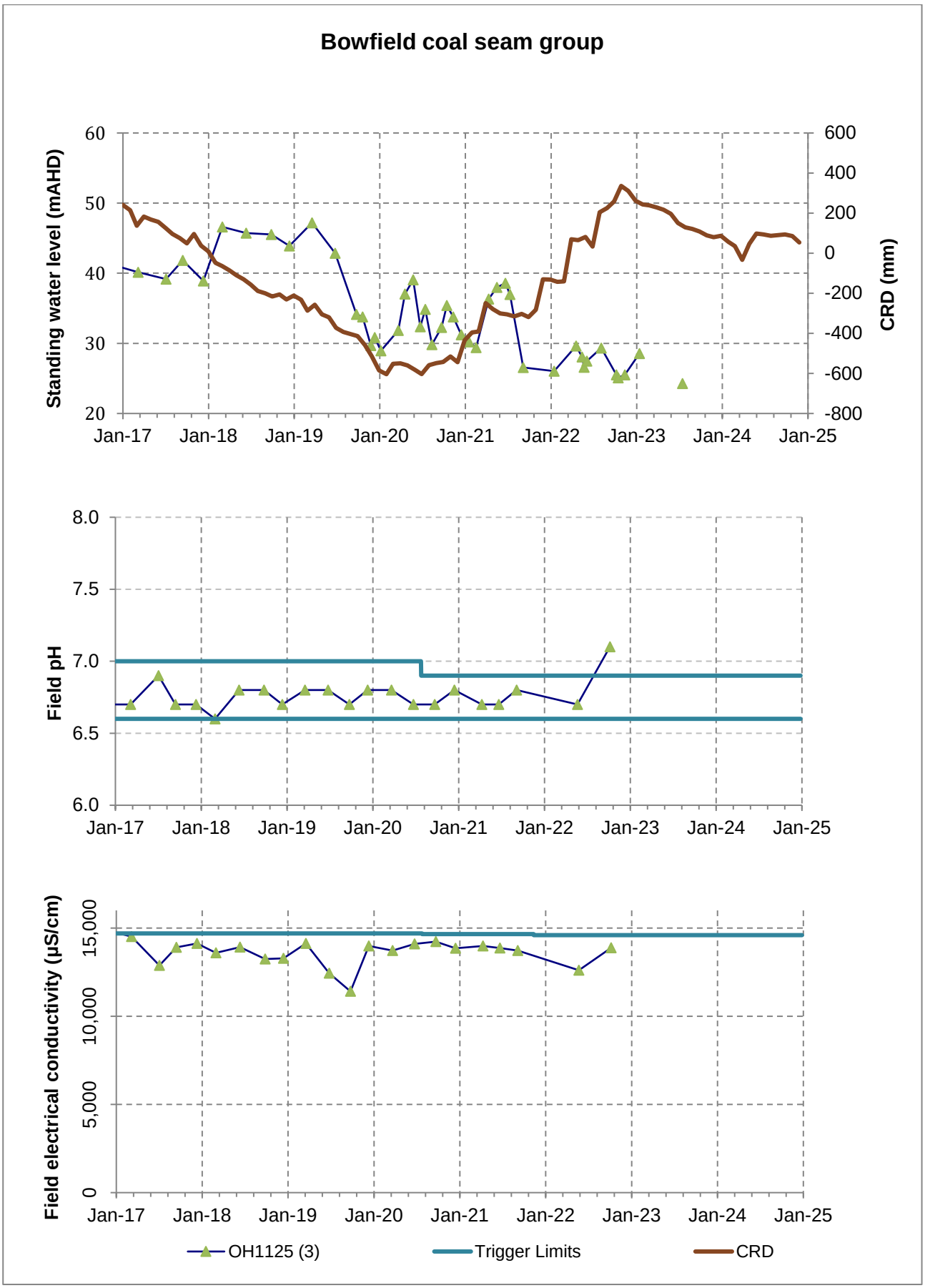


Figure B 4 Bowfield coal seam bores GWL, pH, and EC

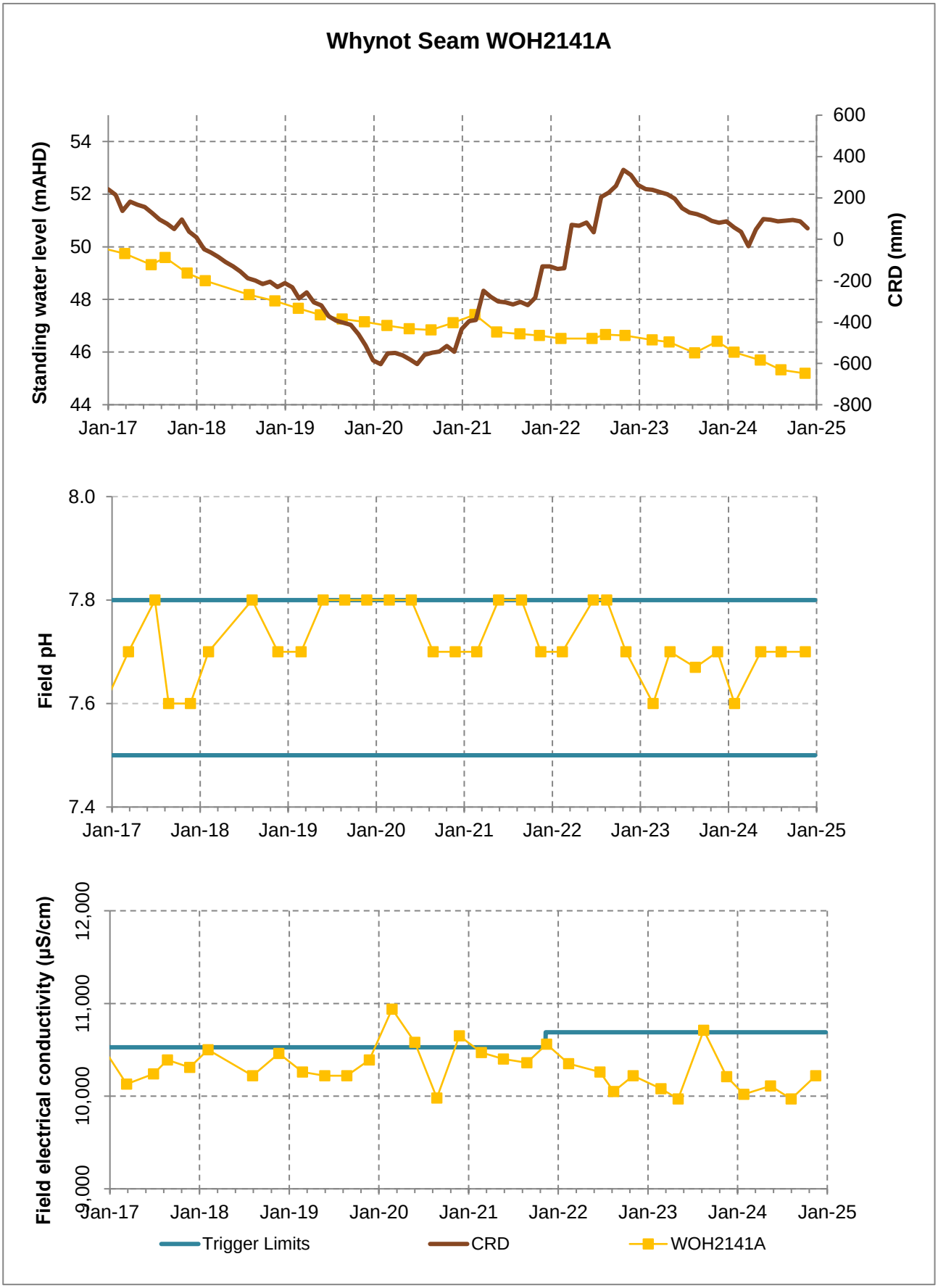


Figure B 5 Whynot coal seam bores GWL, pH, and EC

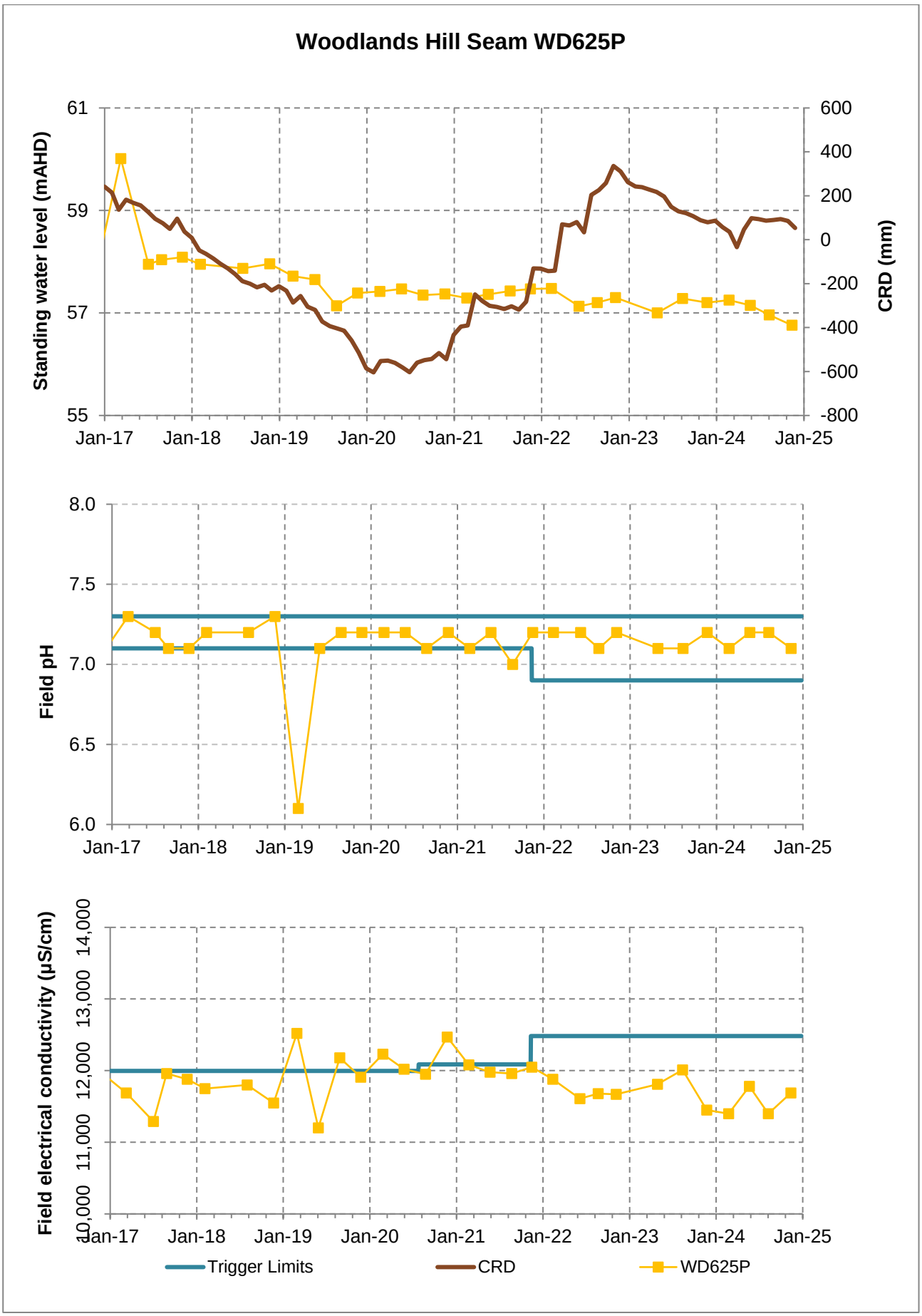


Figure B 6 Woodlands Hill coal seam bores GWL, pH, and EC

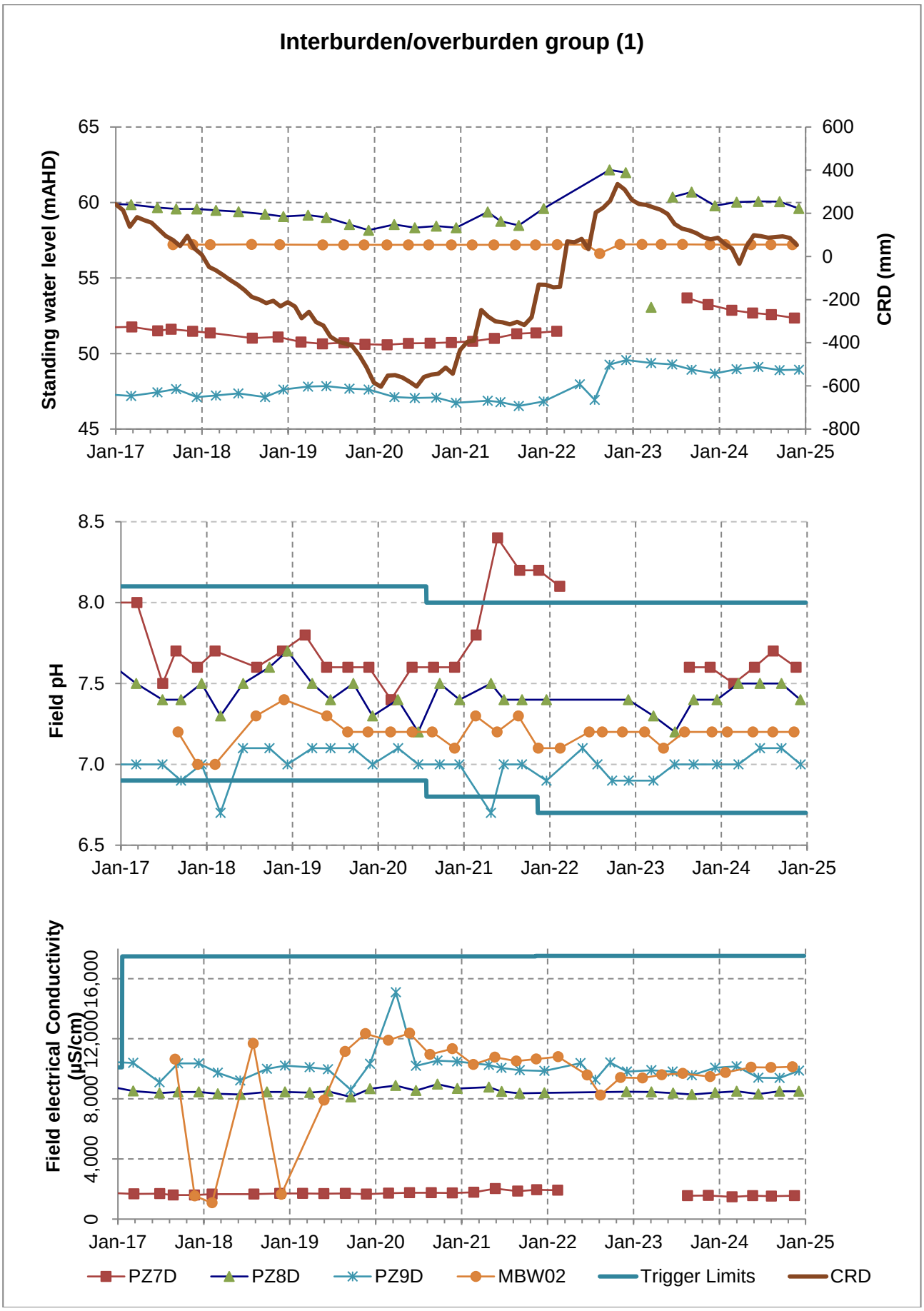


Figure B 7 Shallow overburden bores GWL, pH, and EC (1)

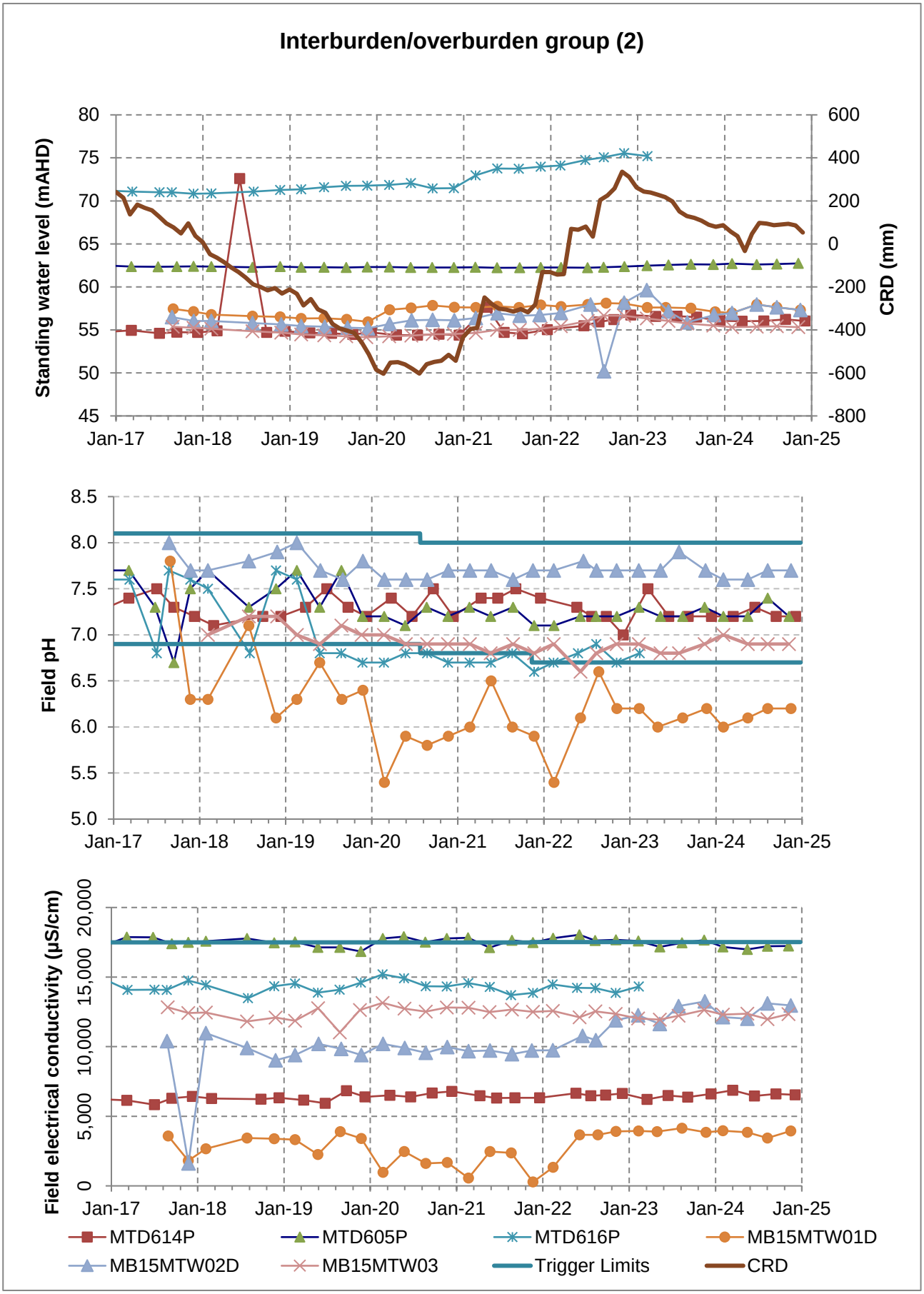


Figure B 8 Shallow overburden bores GWL, pH, and EC (2)

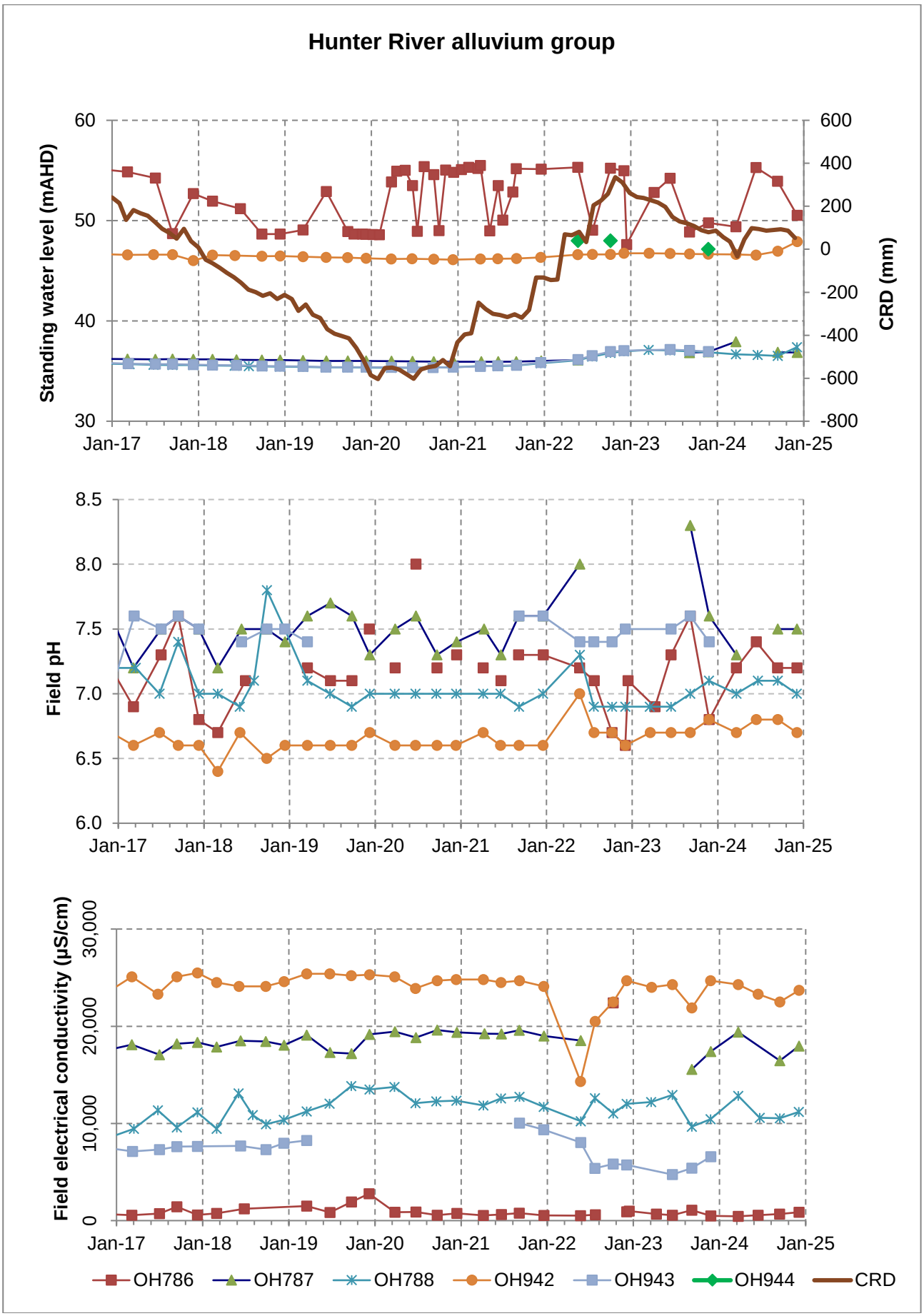


Figure B 9 Hunter River alluvium bores GWL, pH, and EC

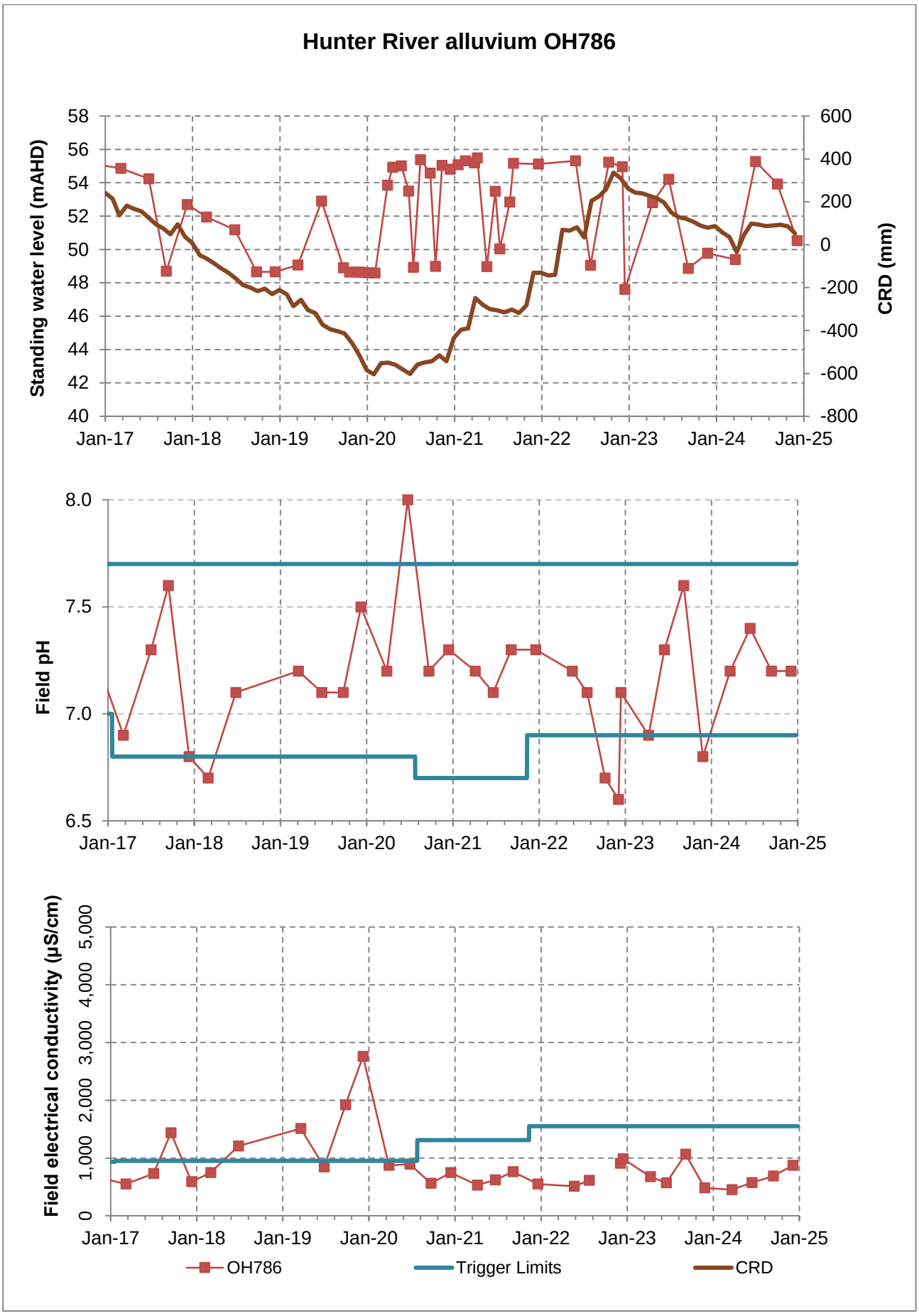


Figure B 10 Hunter River bore OH786 GWL, pH, and EC

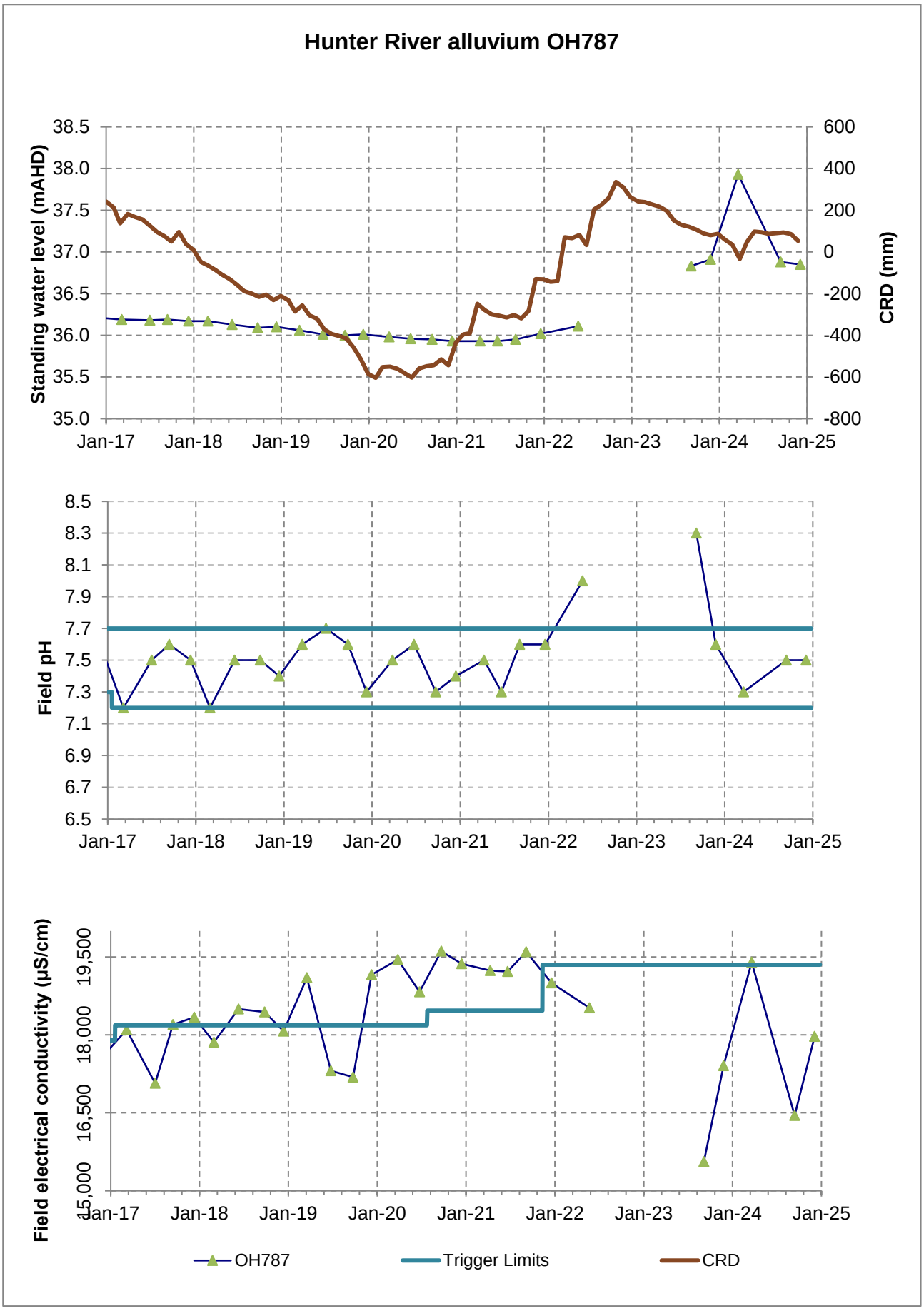


Figure B 11 Hunter River bore OH787 GWL, pH, and EC

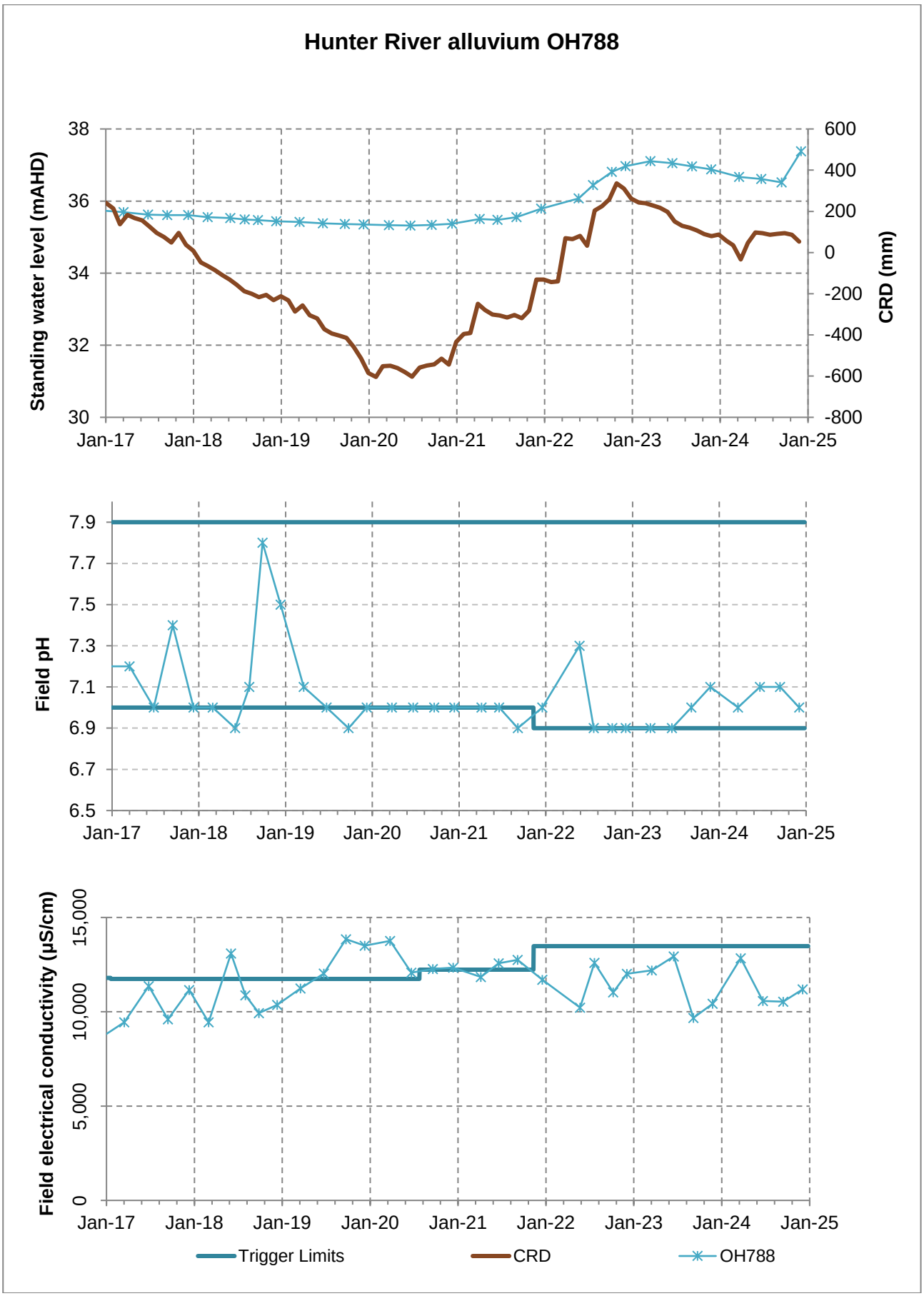


Figure B 12 Hunter River bore OH788 GWL, pH, and EC

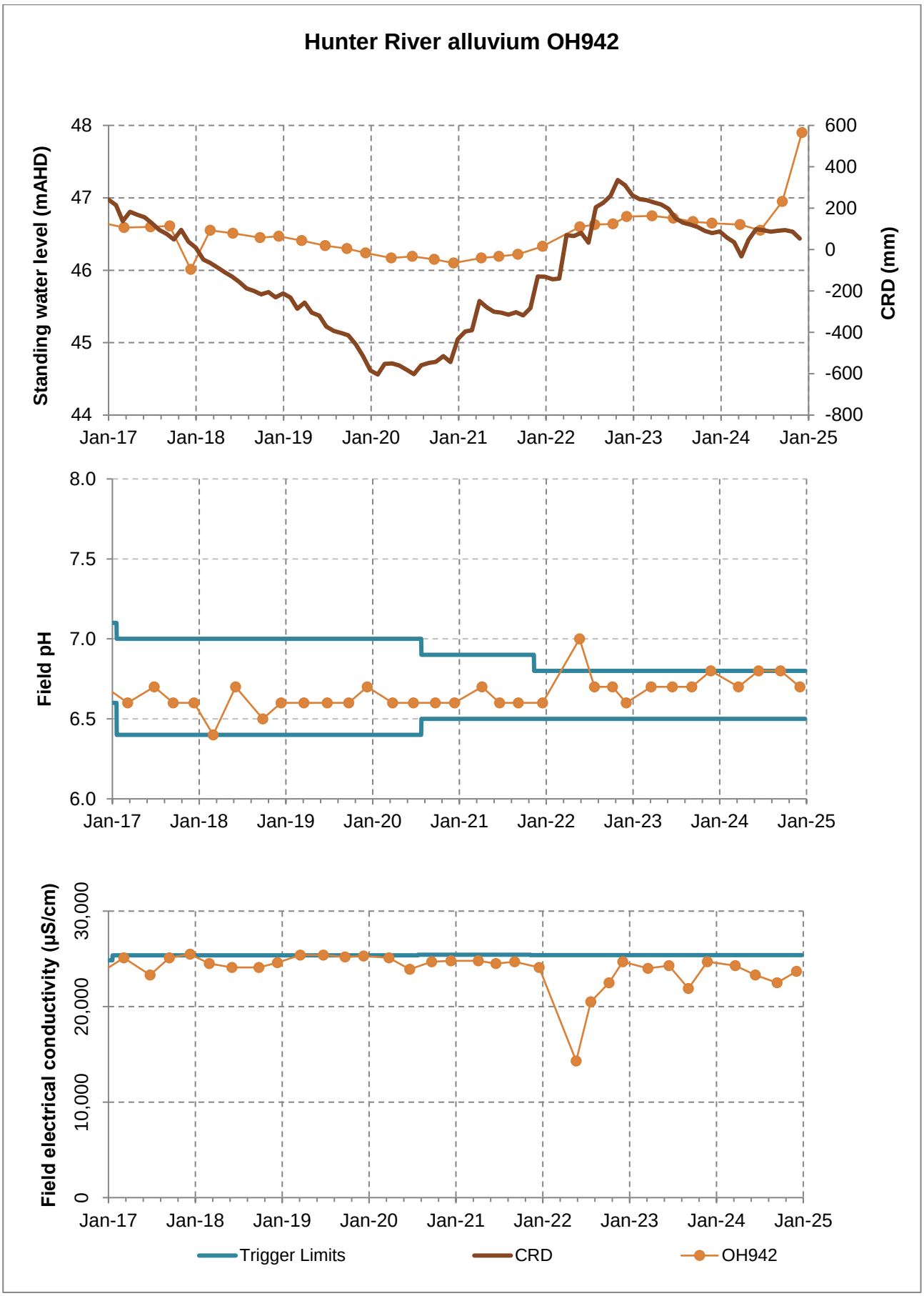


Figure B 13 Hunter River bore OH942 GWL, pH, and EC

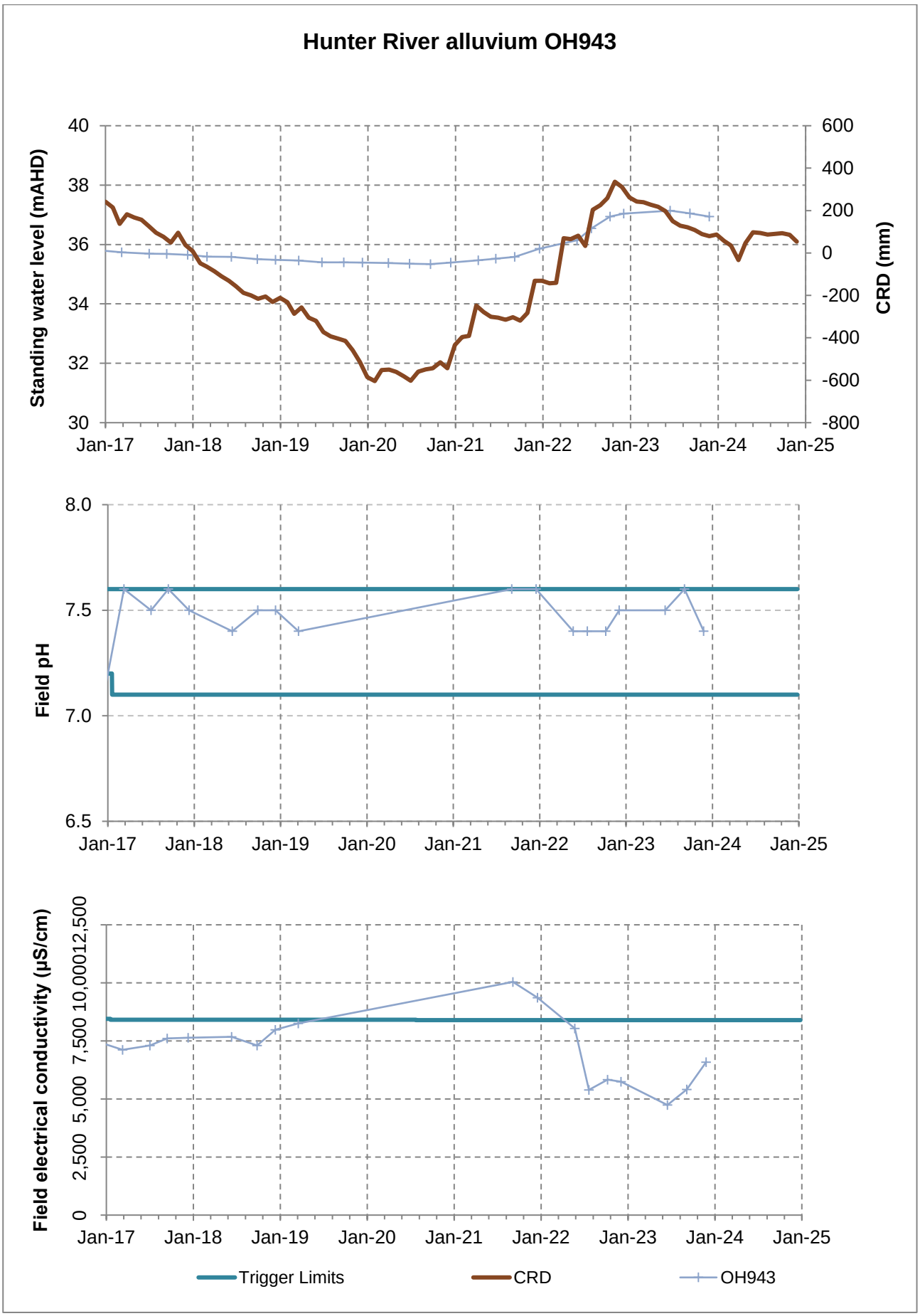


Figure B 14 Hunter River bore OH943 GWL, pH, and EC

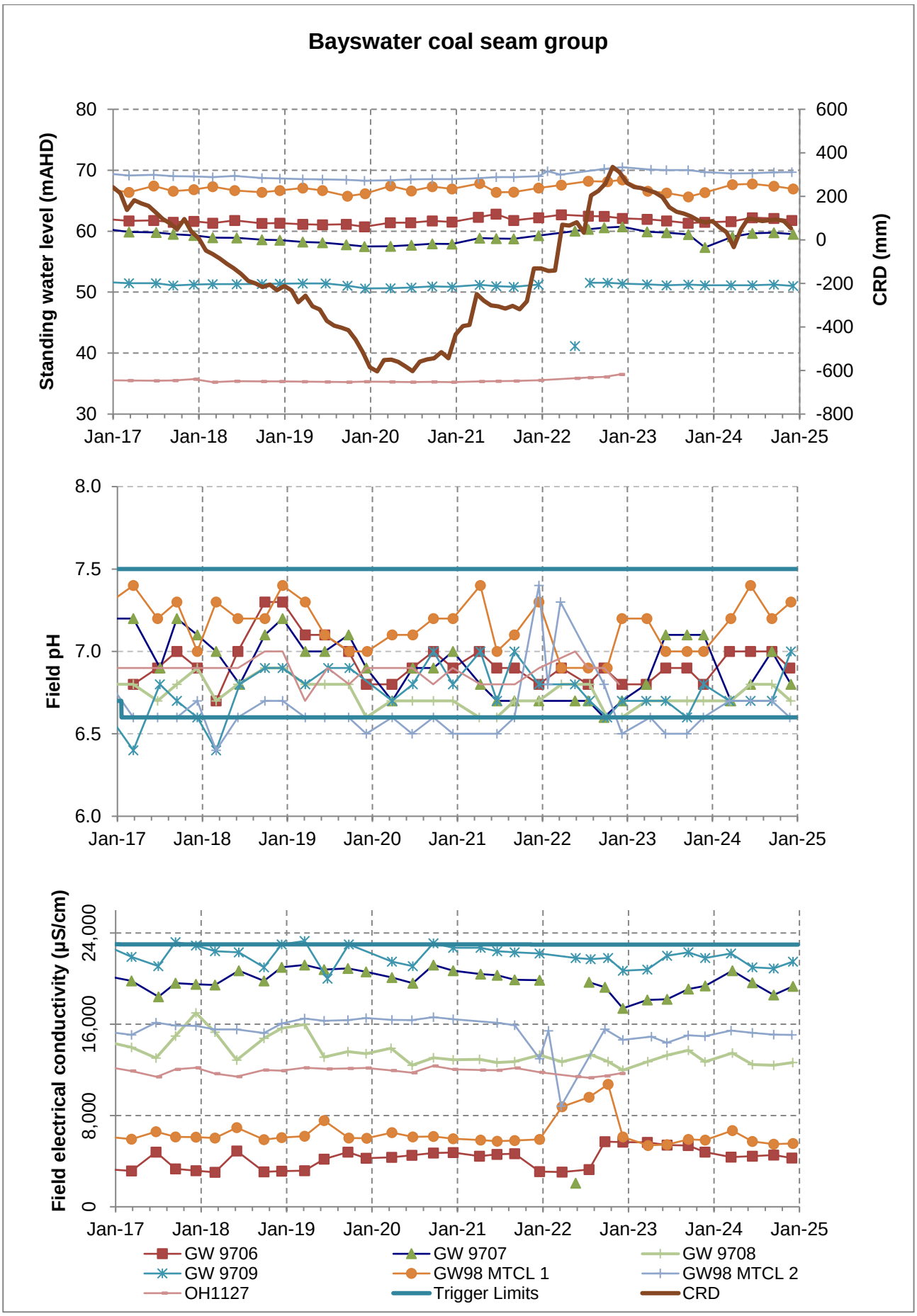


Figure B 15 Bayswater coal seam bores GWL, pH, and EC

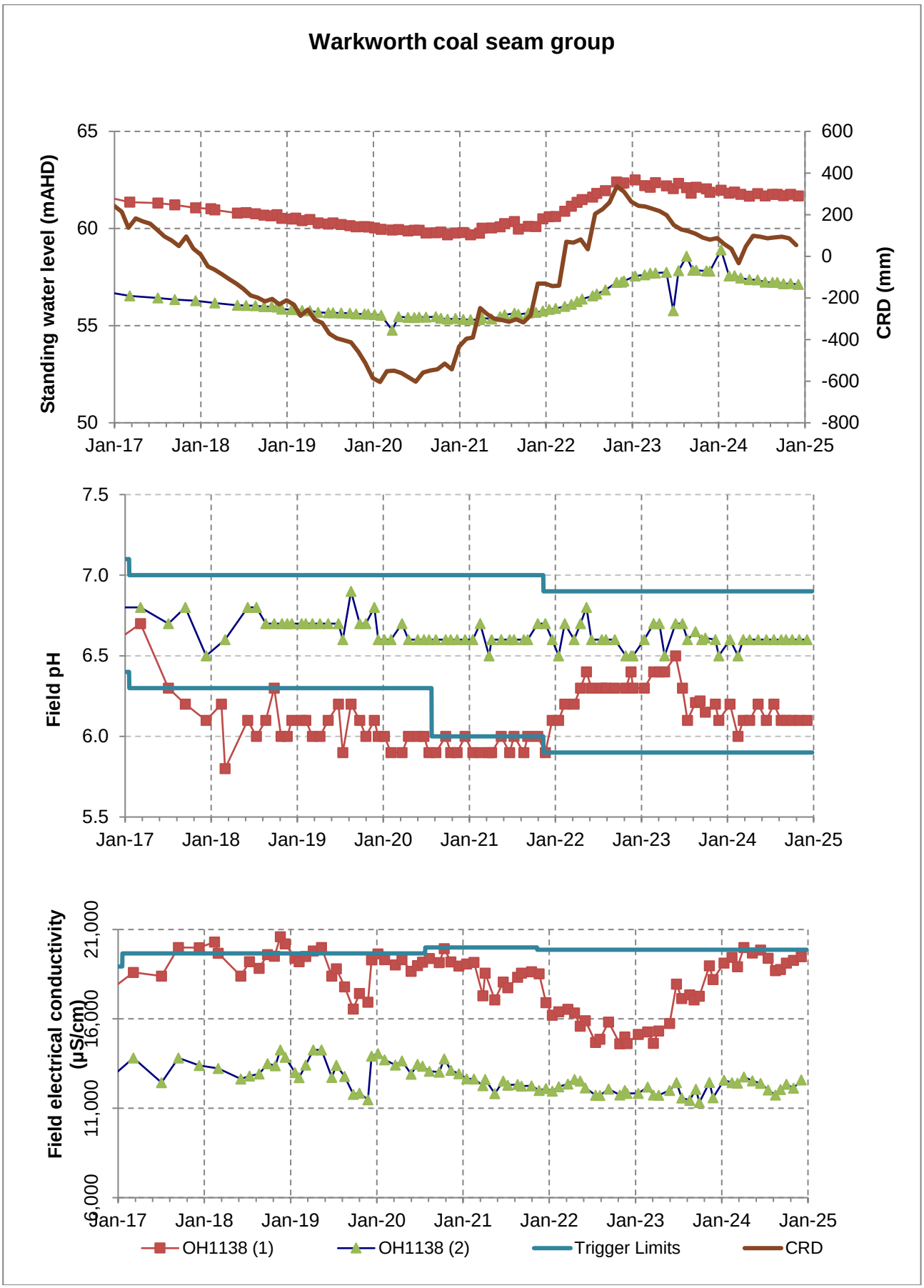


Figure B 16 Warkworth coal seam bores GWL, pH, and EC

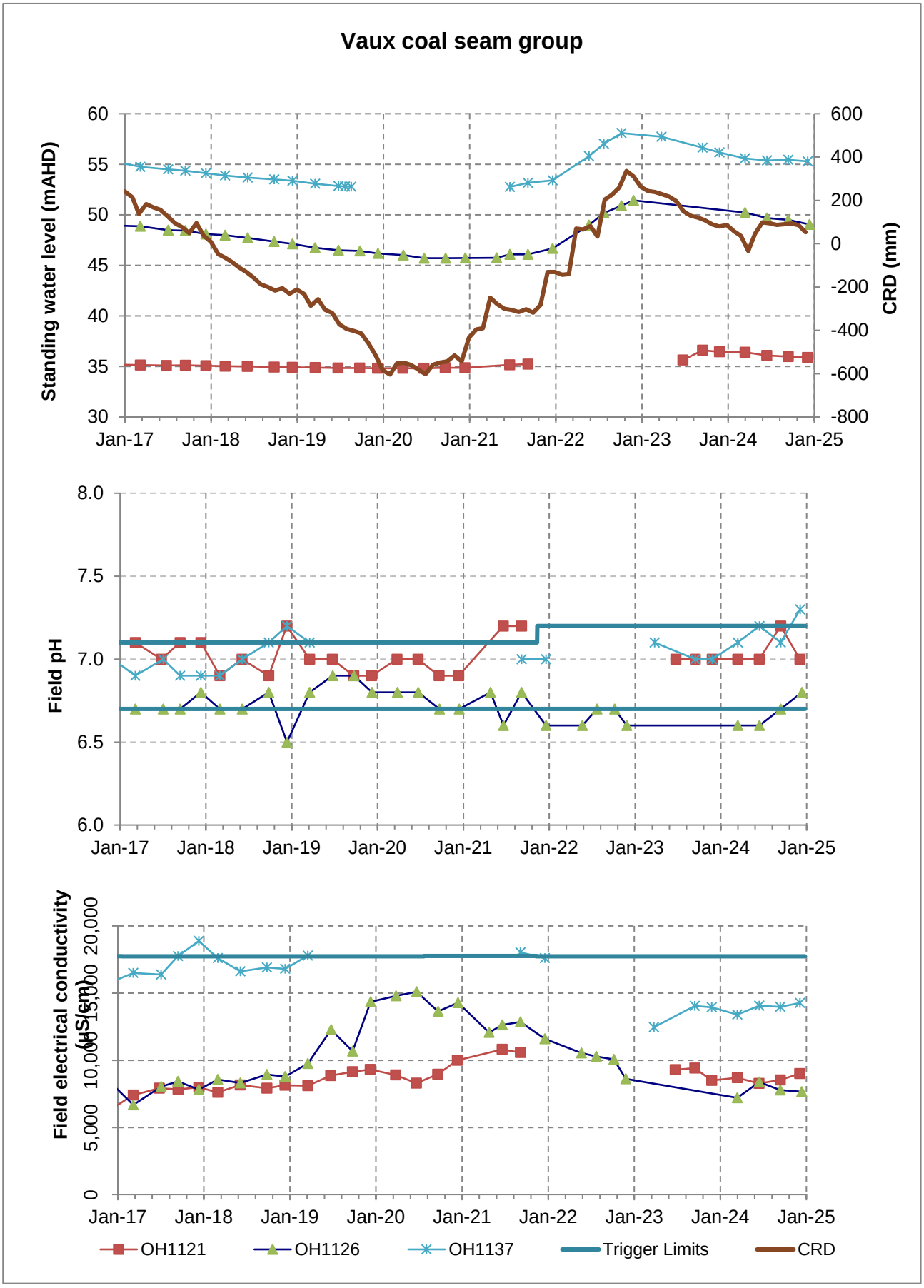


Figure B 17 Vaux coal seam bores GWL, pH, and EC

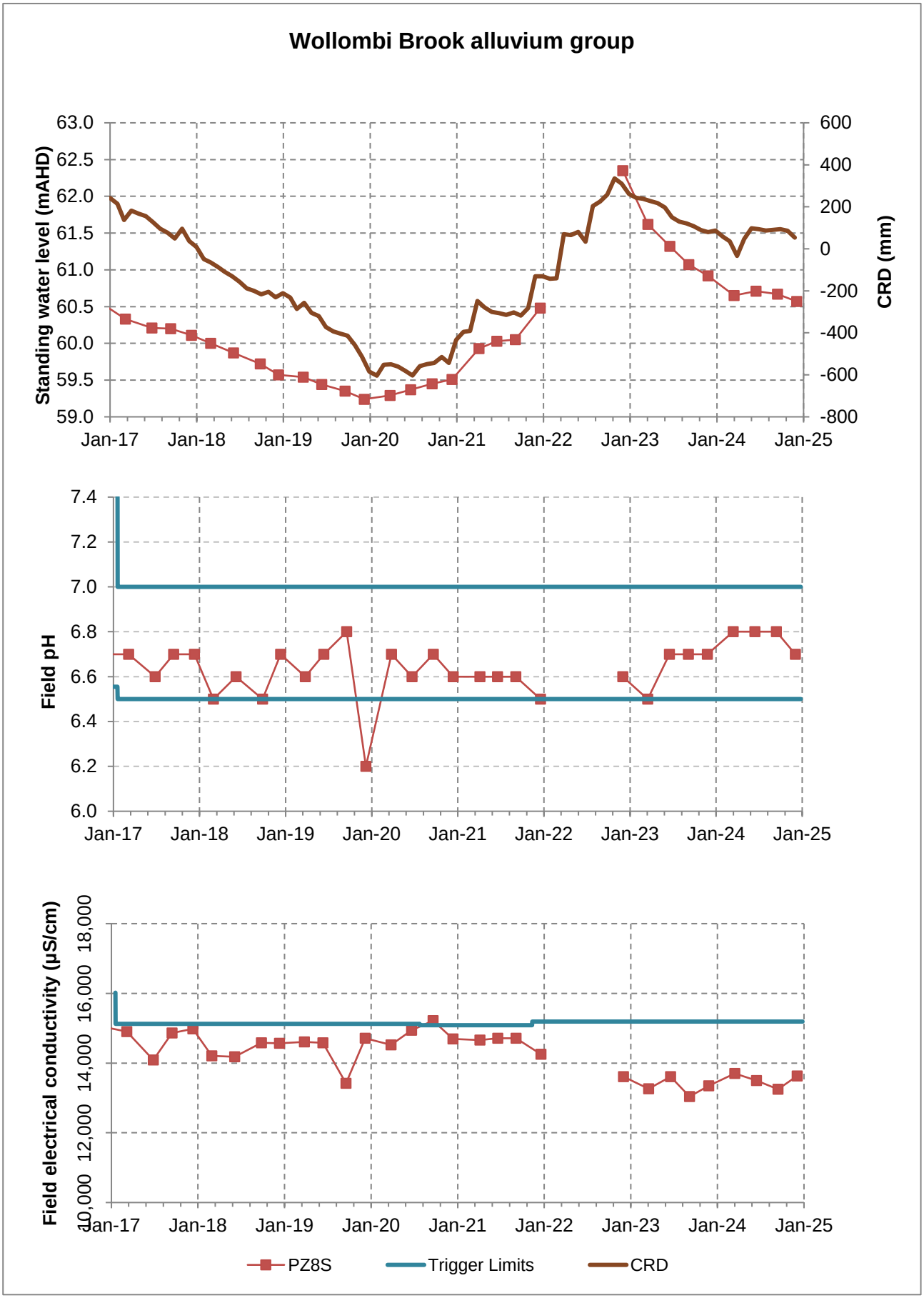


Figure B 18 Wollombi Brook alluvium bore PZ8S GWL, pH, and EC

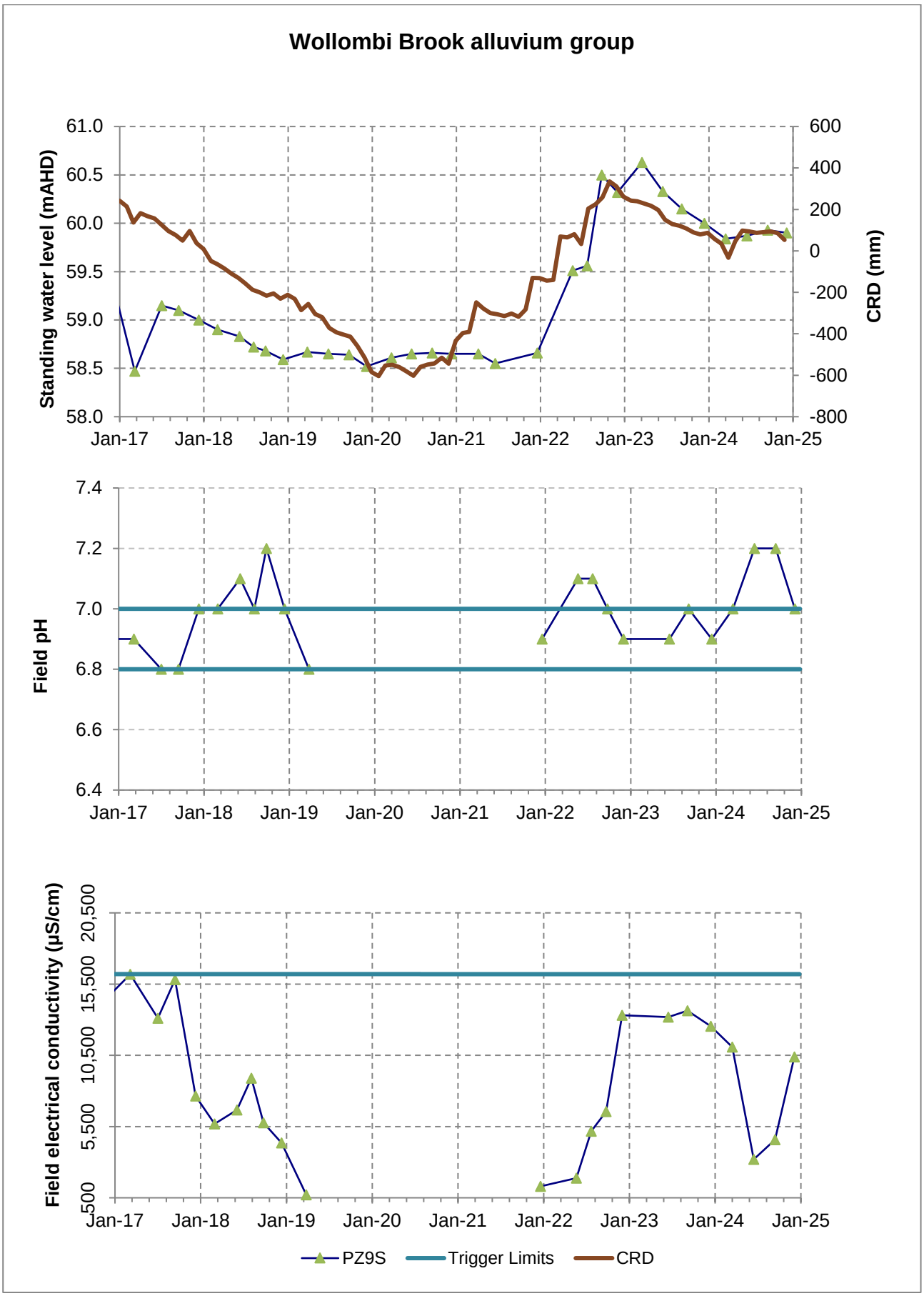


Figure B 19 Wollombi Brook alluvium bore PZ9S GWL, pH, and EC

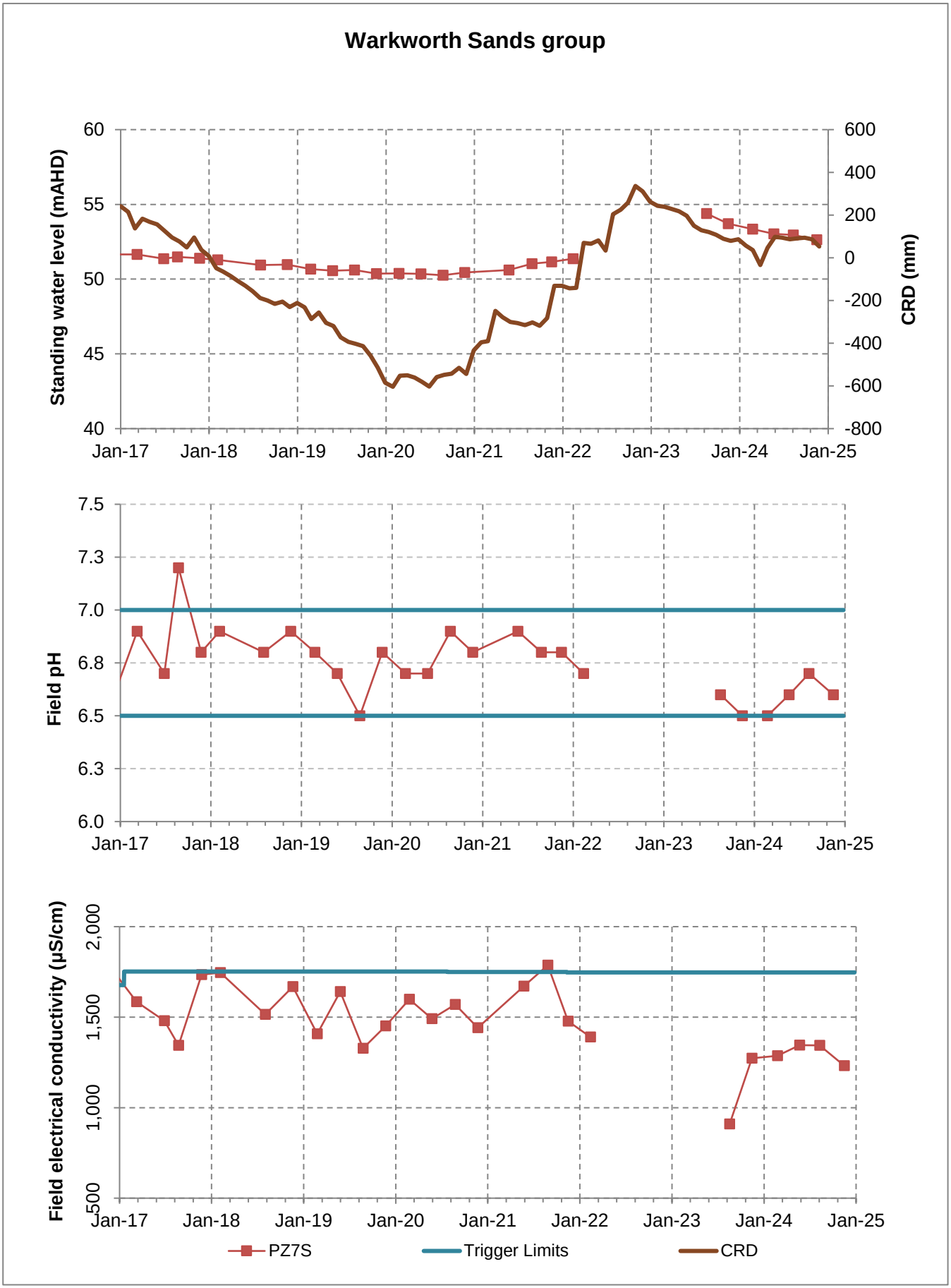


Figure B 20 Warkworth Sands bore PZ7S GWL, pH, and EC

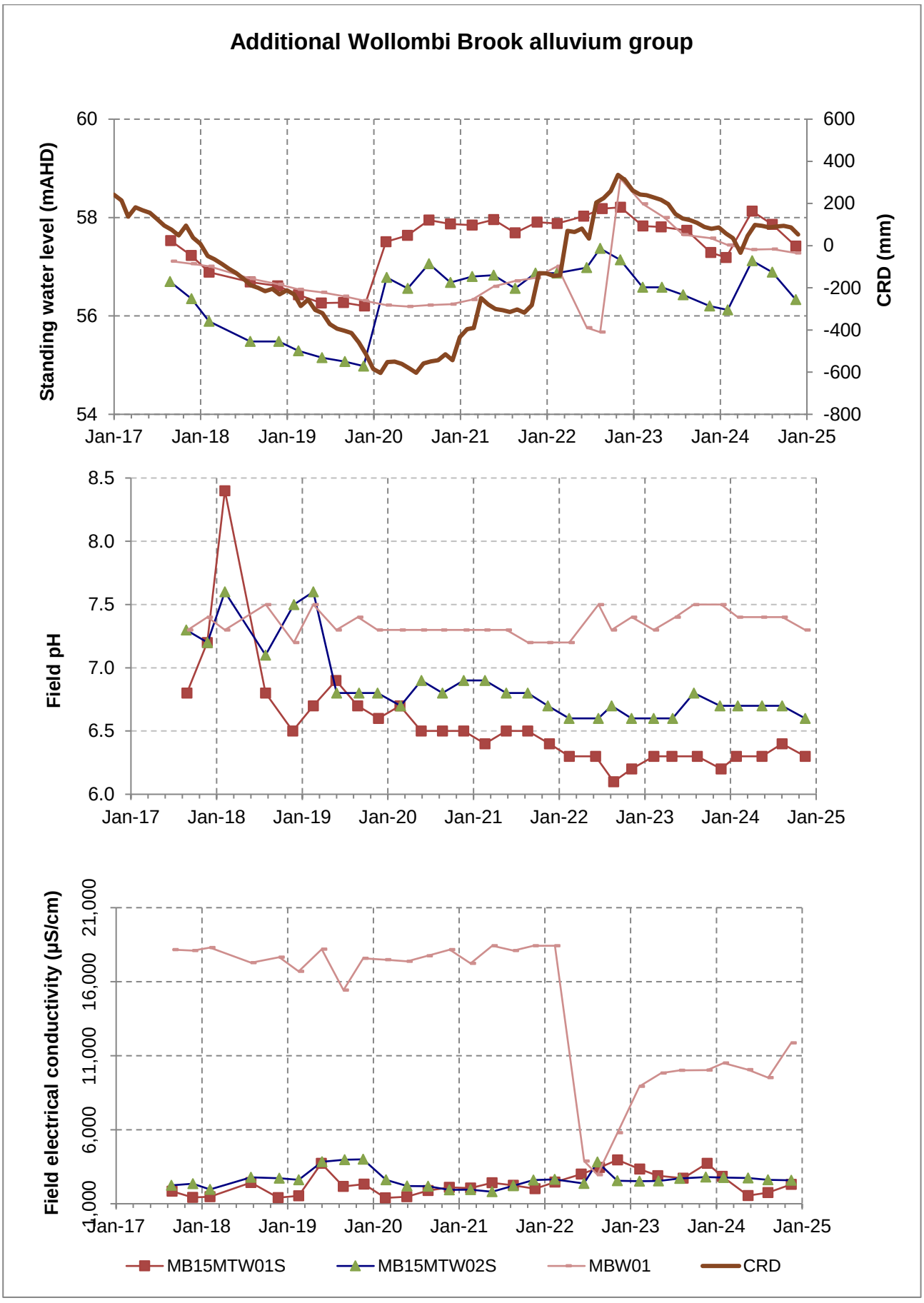


Figure B 21 Additional Wollombi Brook alluvium bores GWL, pH, and EC

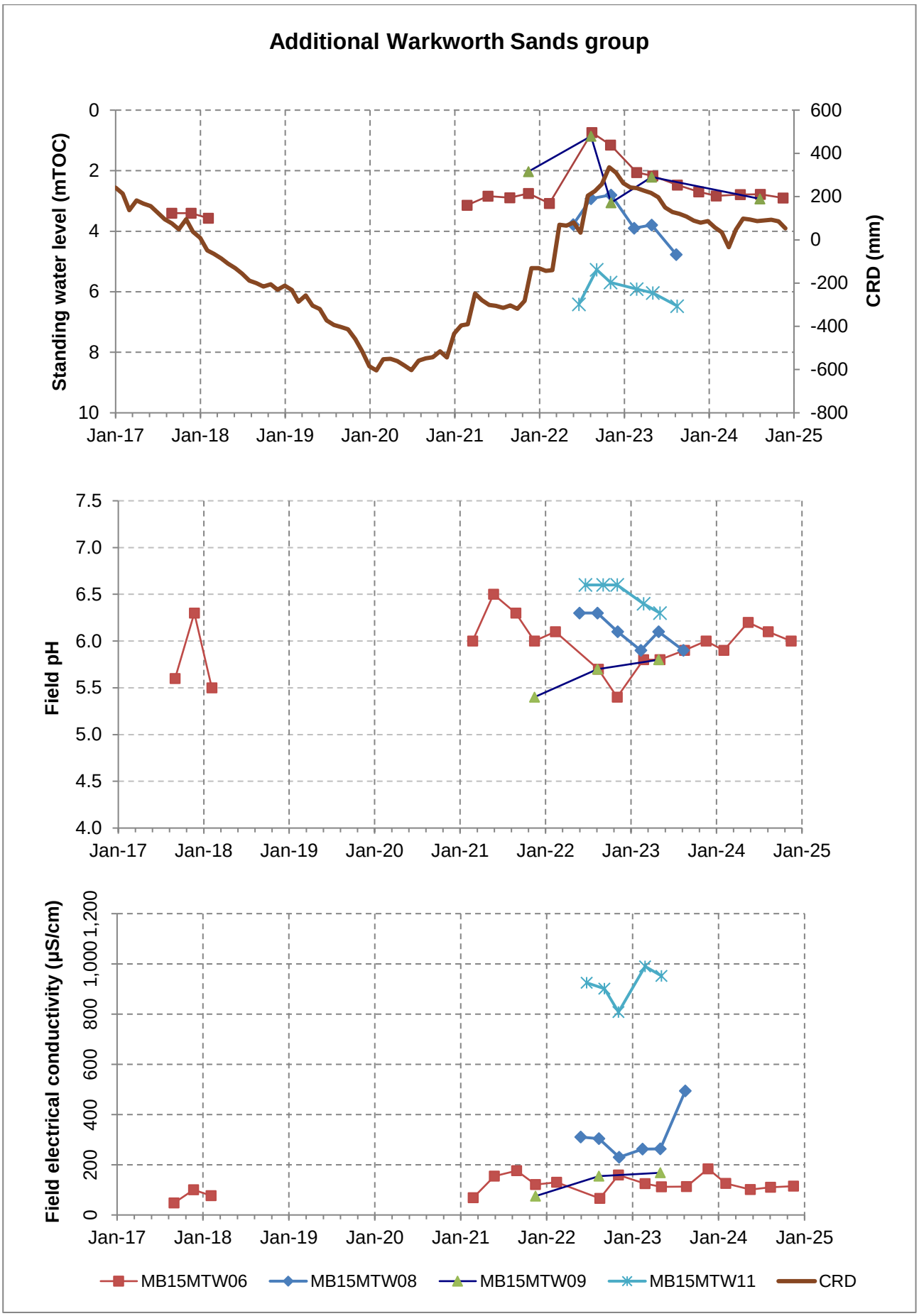


Figure B 22 Additional Warkworth Sands bores GWL, pH, and EC

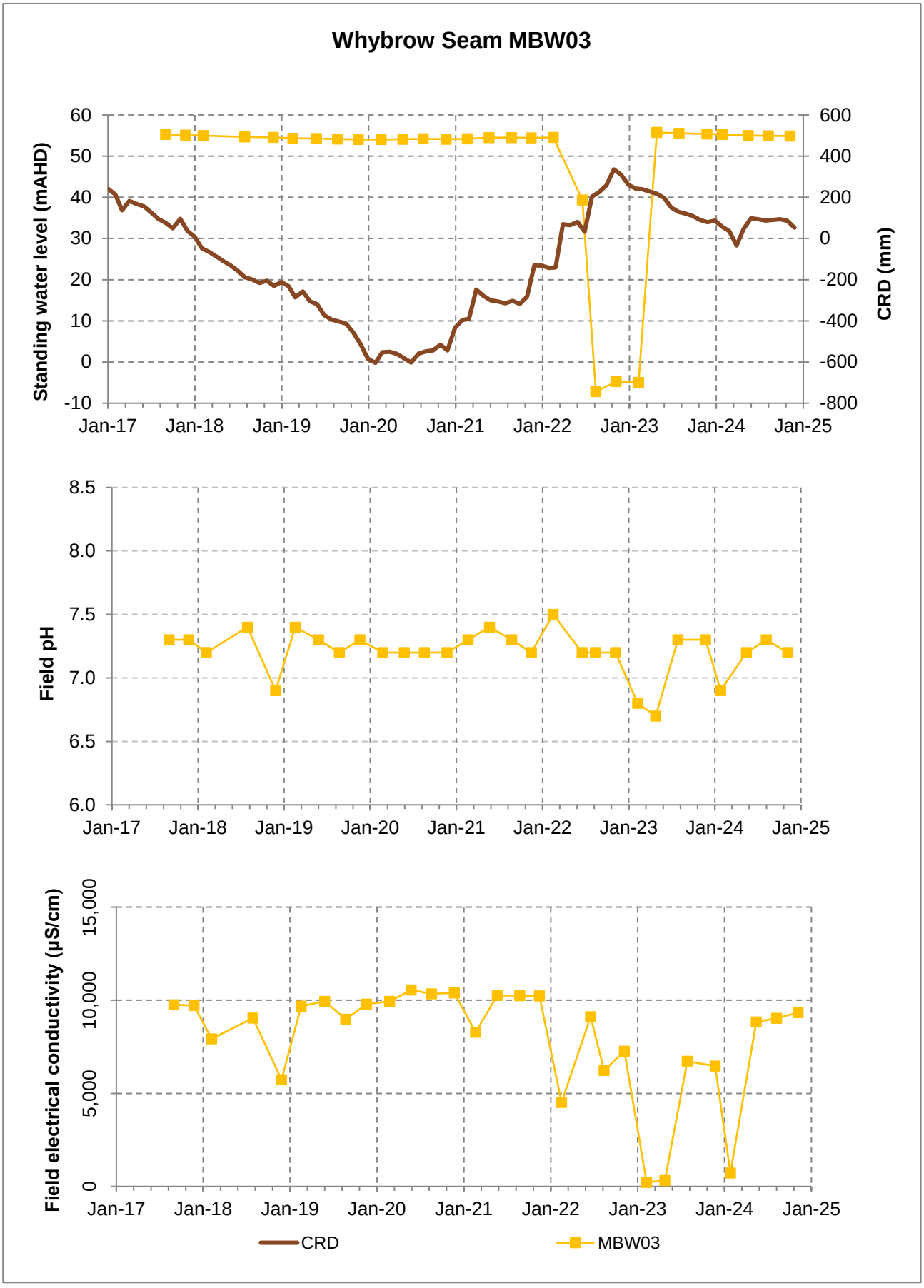


Figure B 23 Whybrow coal seam bore MBW03 GWL, pH, and EC

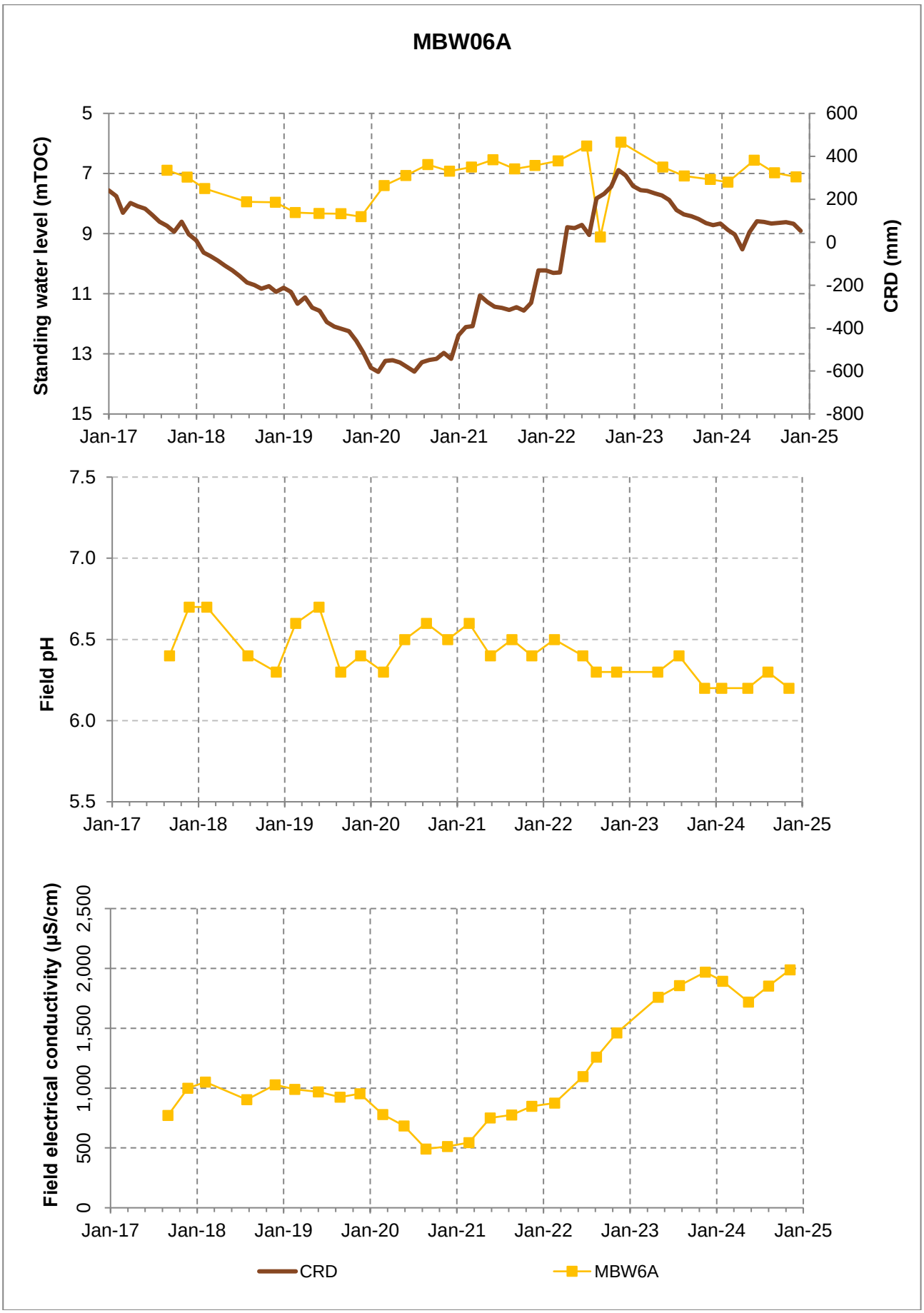
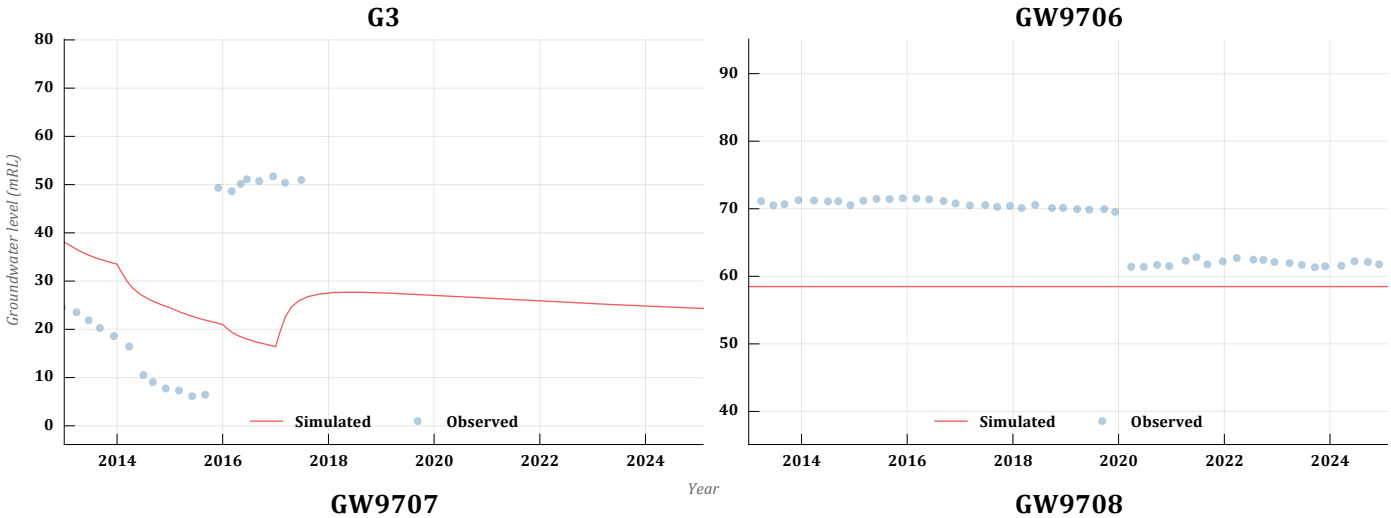


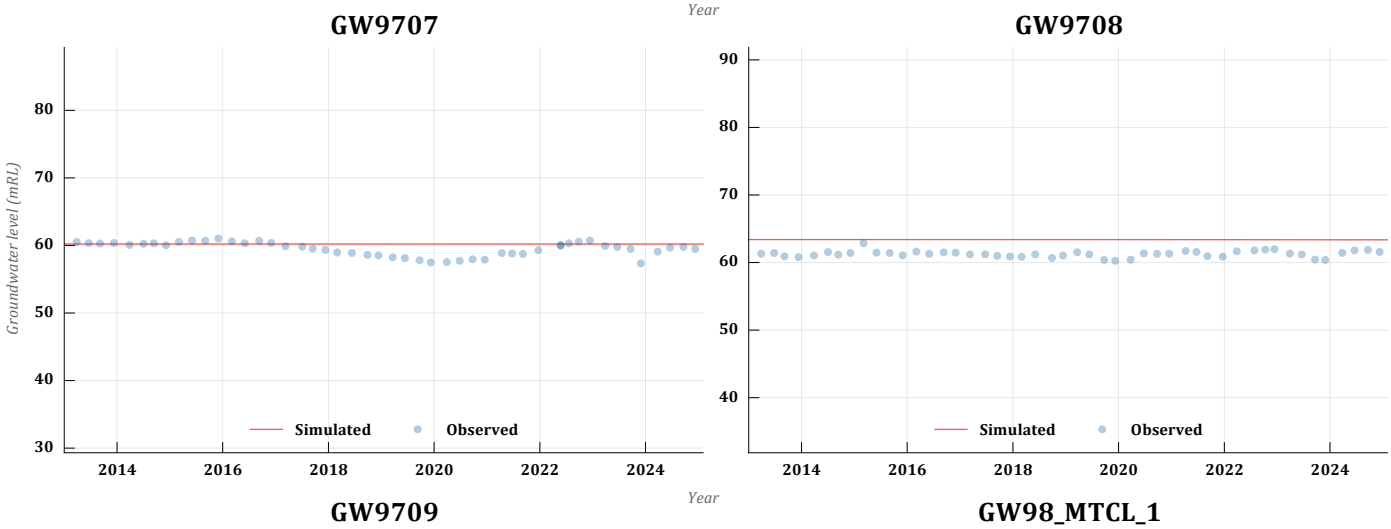
Figure B 24 MBW06 GWL, pH, and EC

Appendix C

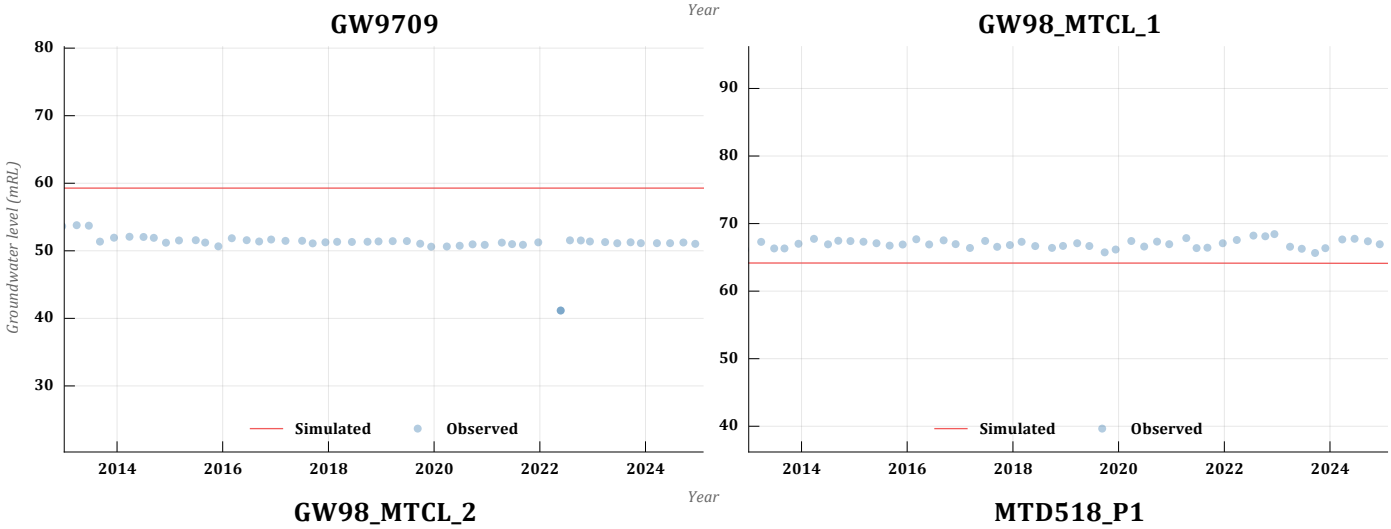
Model verification graphs


G3
Groundwater level (mRL)
Simulated
Observed
Year

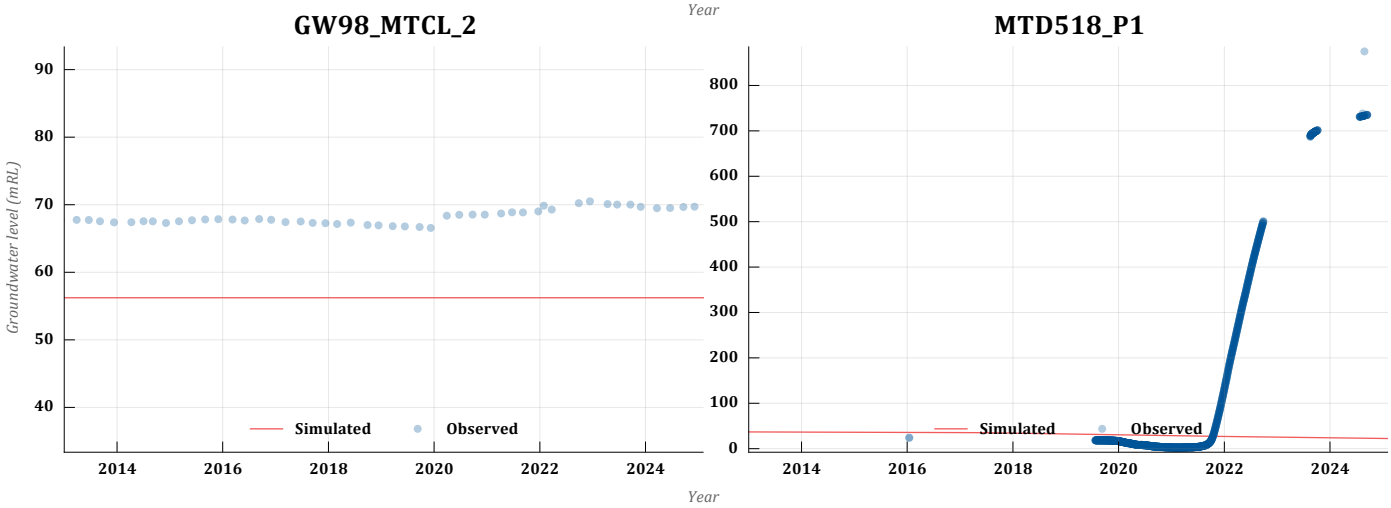
GW9706
Simulated
Observed


GW9707
Groundwater level (mRL)
Simulated
Observed
Year

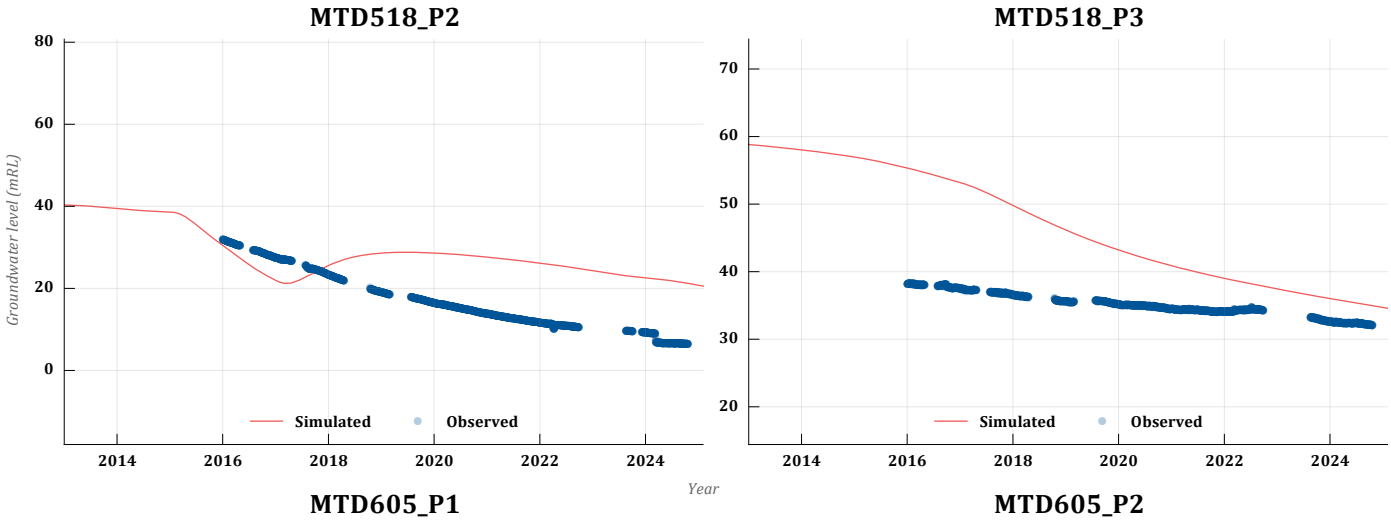
GW9708
Simulated
Observed


GW9709
Groundwater level (mRL)
Simulated
Observed
Year

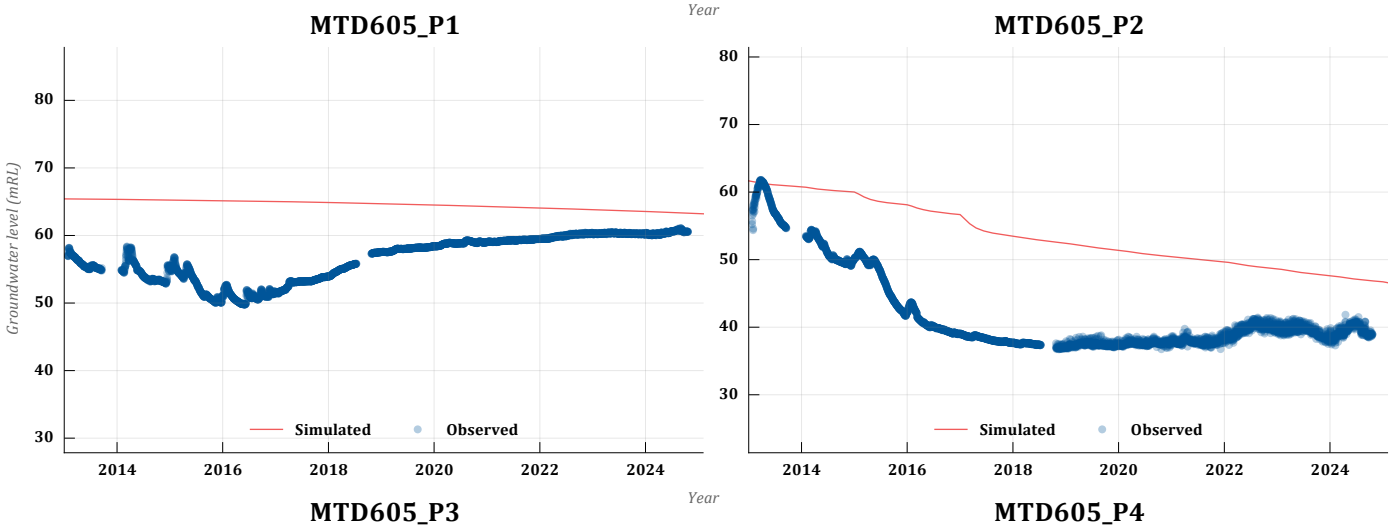
GW98_MTCL_1
Simulated
Observed


GW98_MTCL_2
Groundwater level (mRL)
Simulated
Observed
Year

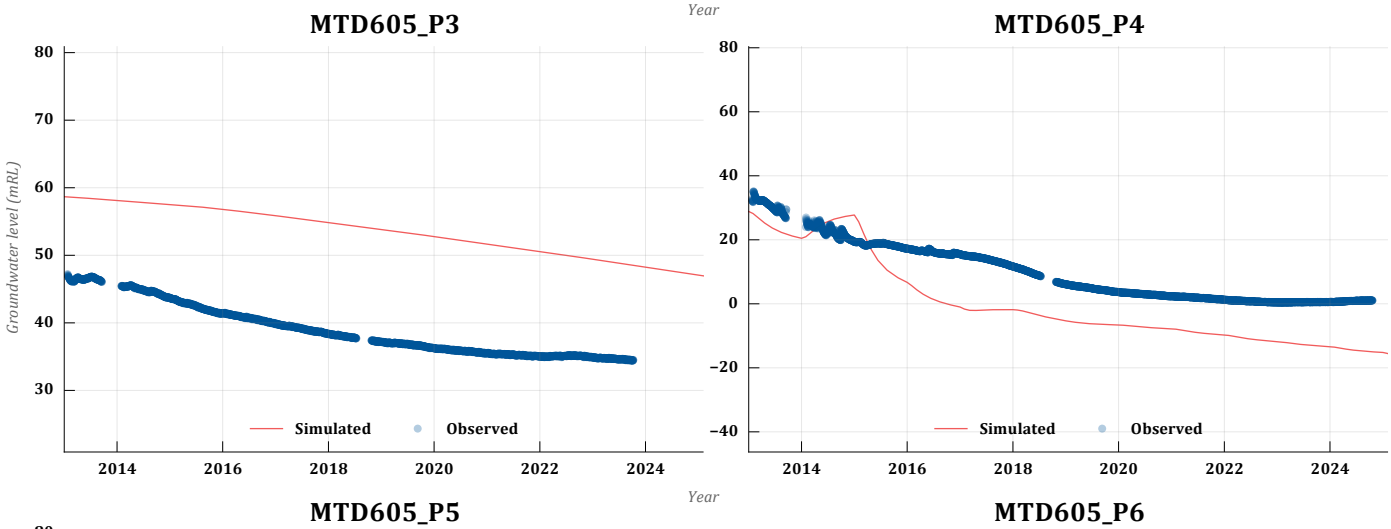
MTD518_P1
Simulated
Observed


MTD518_P2
Groundwater level (mRL)
80
60
40
20
0
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

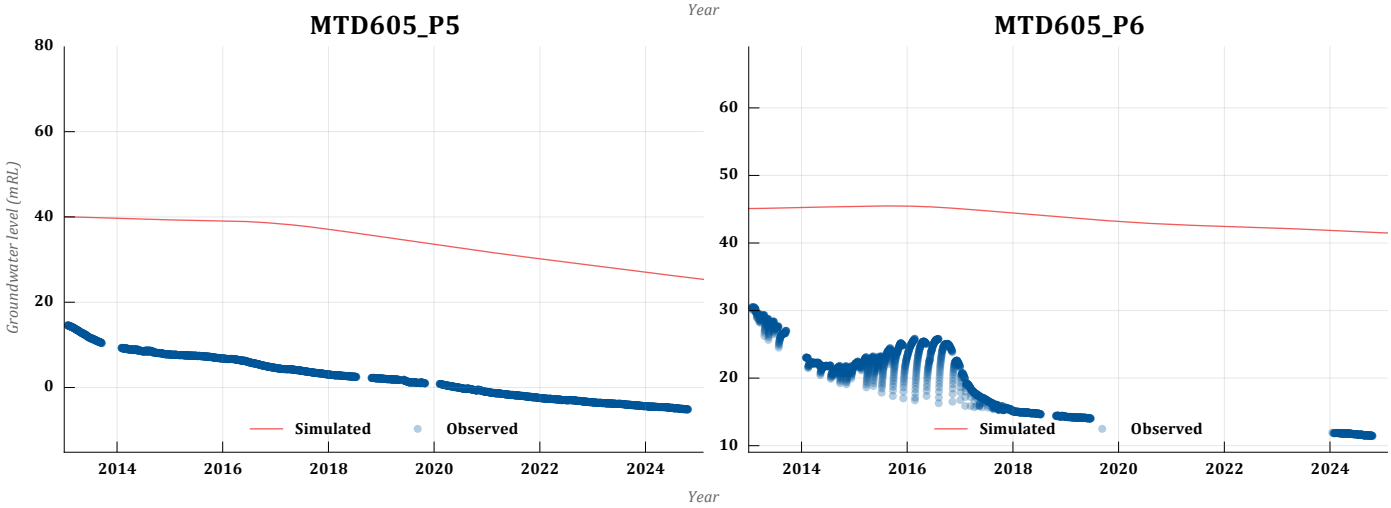
MTD518_P3
70
60
50
40
30
20
Simulated
Observed
2014
2016
2018
2020
2022
2024


MTD605_P1
Groundwater level (mRL)
80
70
60
50
40
30
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

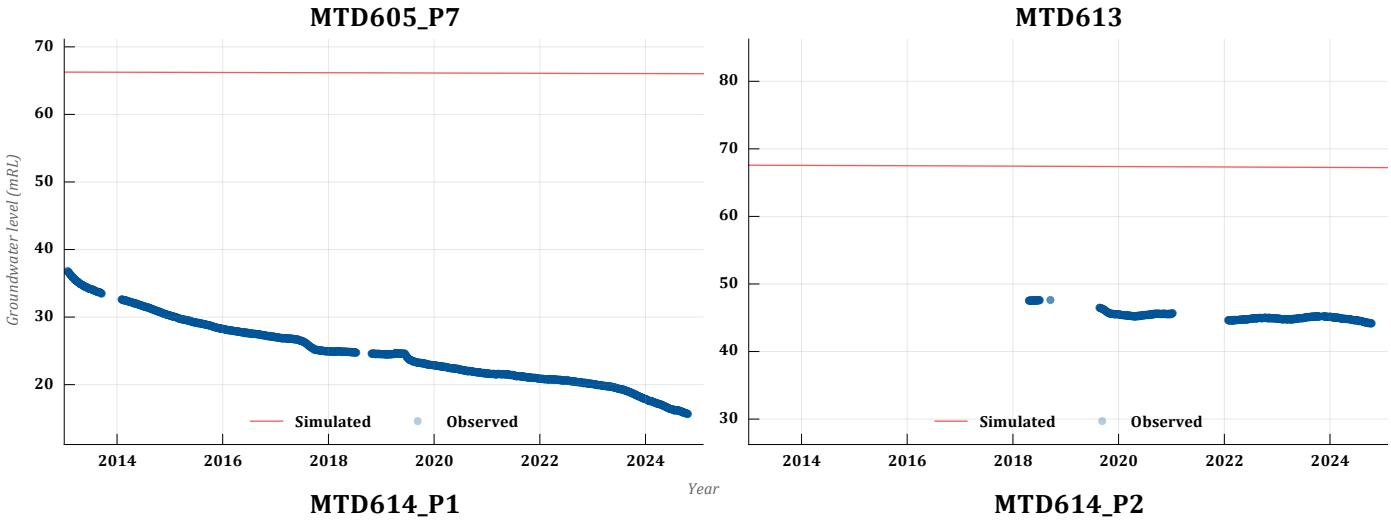
MTD605_P2
80
70
60
50
40
30
Simulated
Observed
2014
2016
2018
2020
2022
2024


MTD605_P3
Groundwater level (mRL)
80
70
60
50
40
30
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

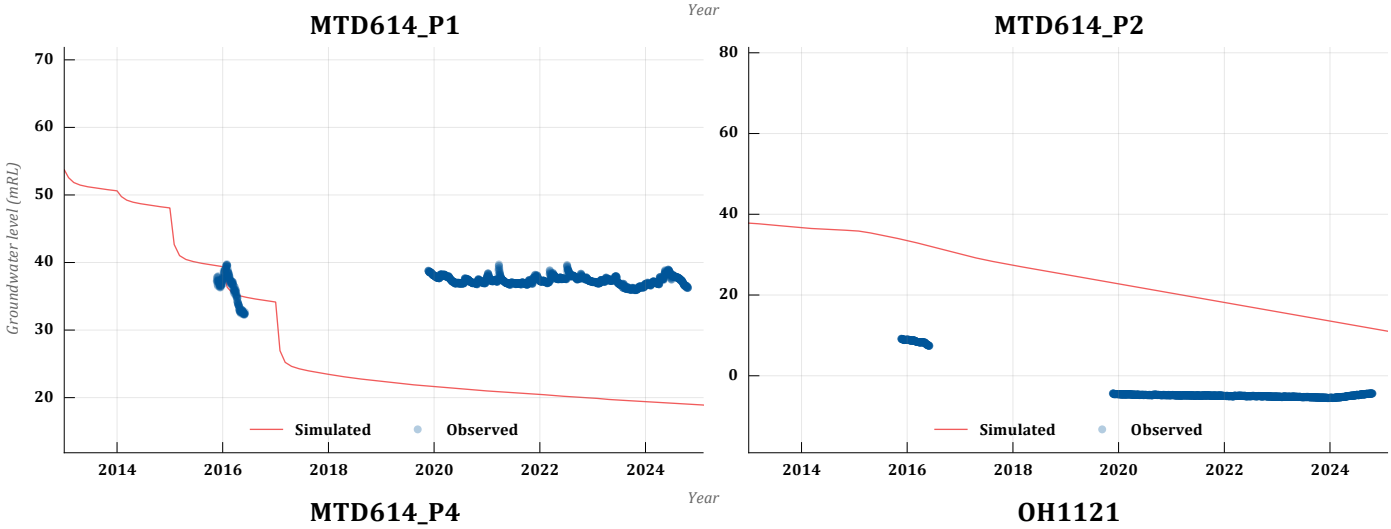
MTD605_P4
80
60
40
20
0
−20
−40
Simulated
Observed
2014
2016
2018
2020
2022
2024


MTD605_P5
Groundwater level (mRL)
80
60
40
20
0
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

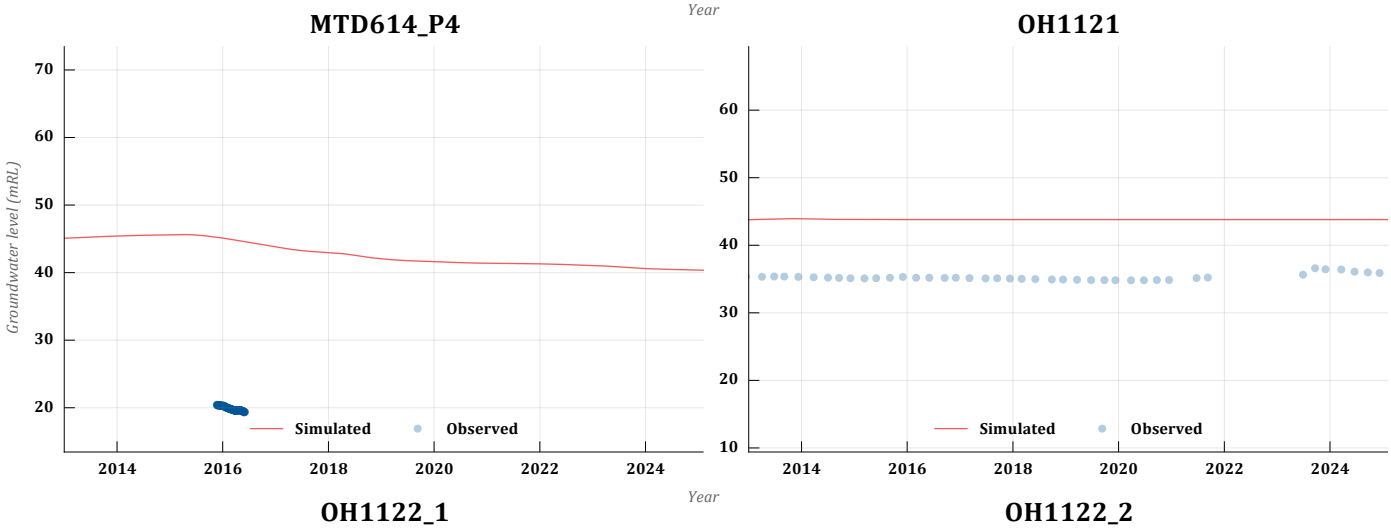
MTD605_P6
60
50
40
30
20
10
Simulated
Observed
2014
2016
2018
2020
2022
2024


MTD605_P7
Groundwater level (mRL)
70
60
50
40
30
20
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

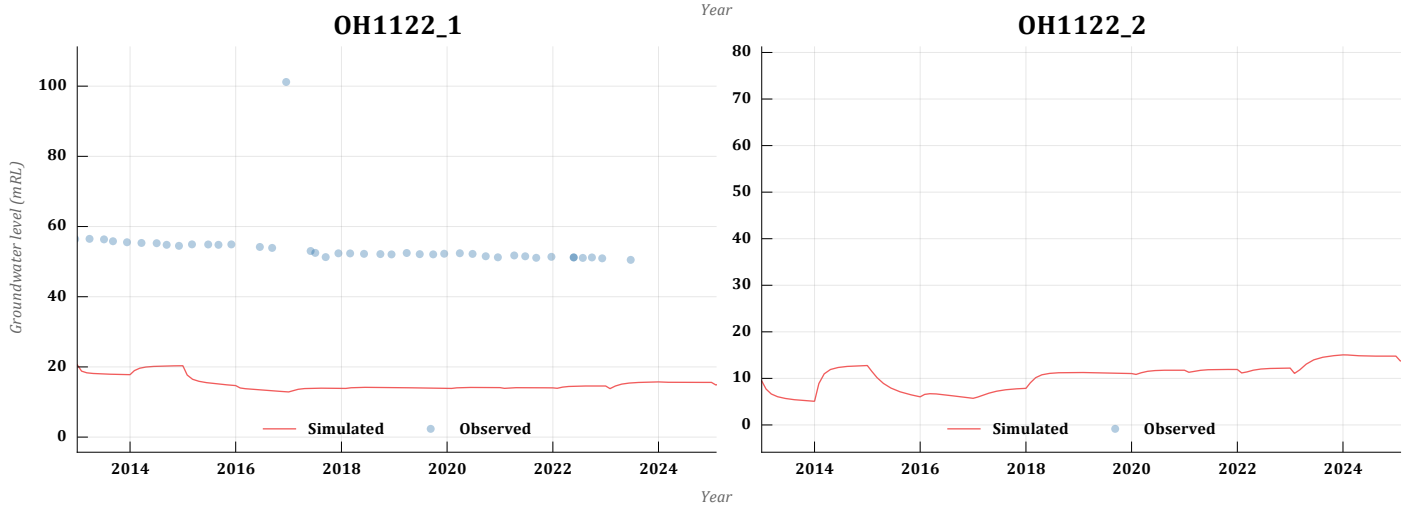
MTD613
80
70
60
50
40
30
Simulated
Observed
2014
2016
2018
2020
2022
2024


MTD614_P1
Groundwater level (mRL)
70
60
50
40
30
20
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

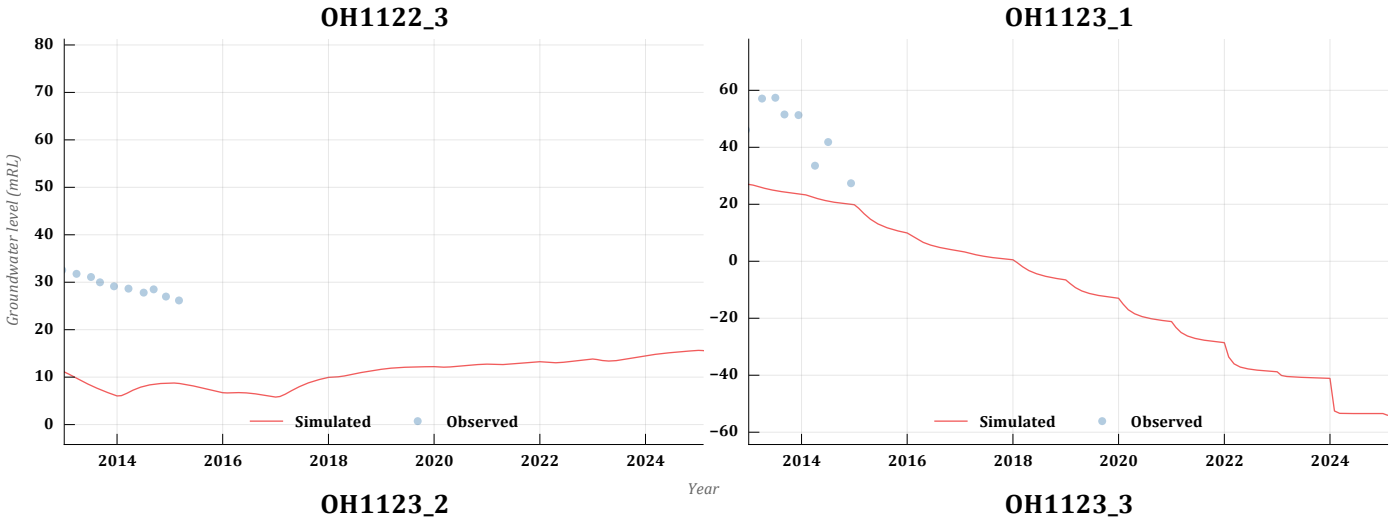
MTD614_P2
80
60
40
20
0
Simulated
Observed
2014
2016
2018
2020
2022
2024


MTD614_P4
Groundwater level (mRL)
70
60
50
40
30
20
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

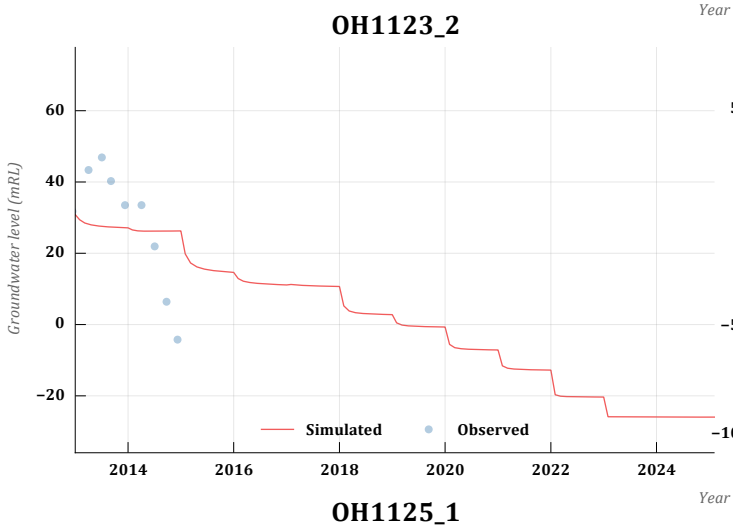
OH1121
60
50
40
30
20
10
Simulated
Observed
2014
2016
2018
2020
2022
2024

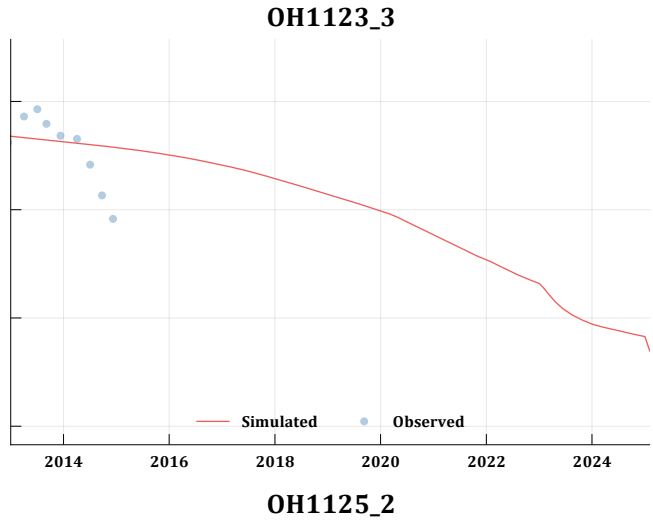

OH1122_1
Groundwater level (mRL)
100
80
60
40
20
0
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

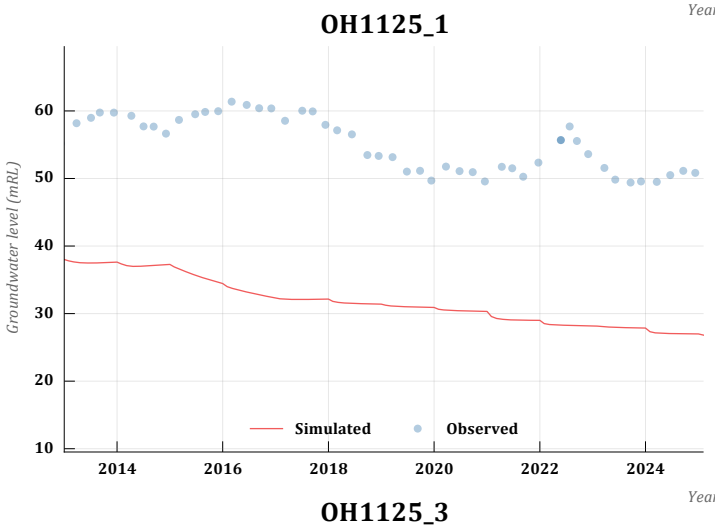
OH1122_2
80
70
60
50
40
30
20
10
0
Simulated
Observed
2014
2016
2018
2020
2022
2024

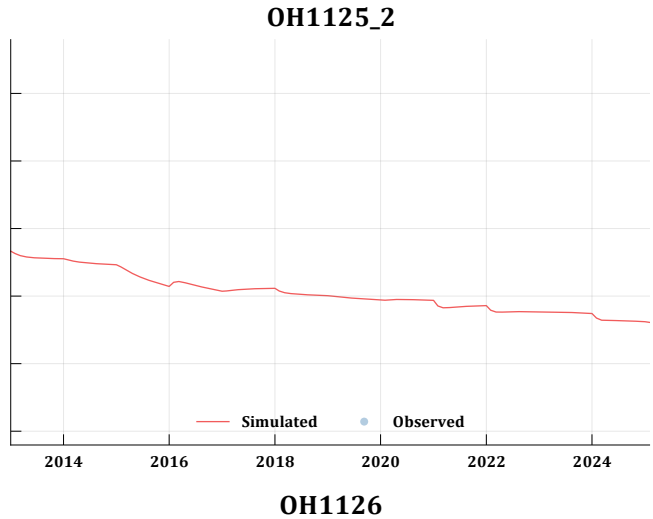

OH1122_3
Groundwater level (mRL)
Simulated
Observed
Year

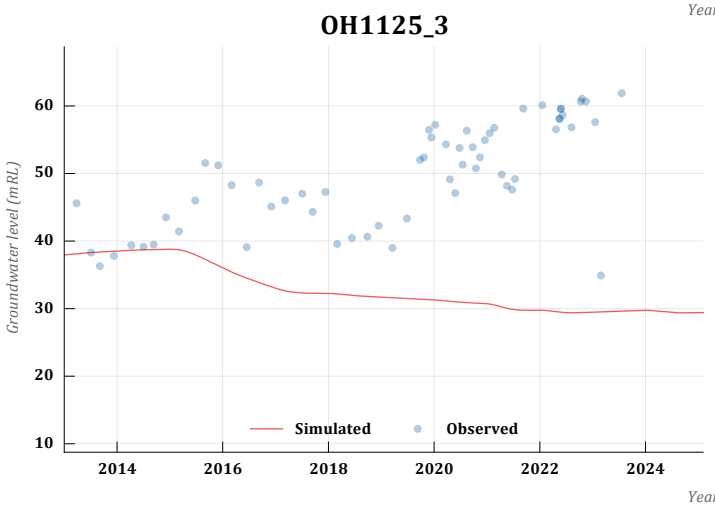
OH1123_1
Simulated
Observed
Year

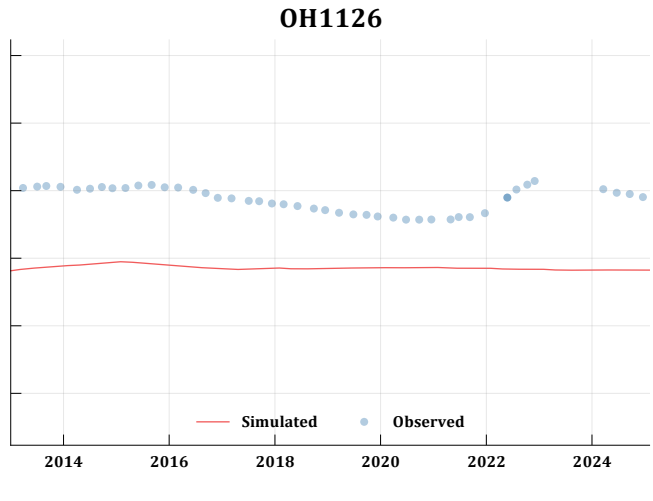

OH1123_2
Groundwater level (mRL)
Simulated
Observed
Year

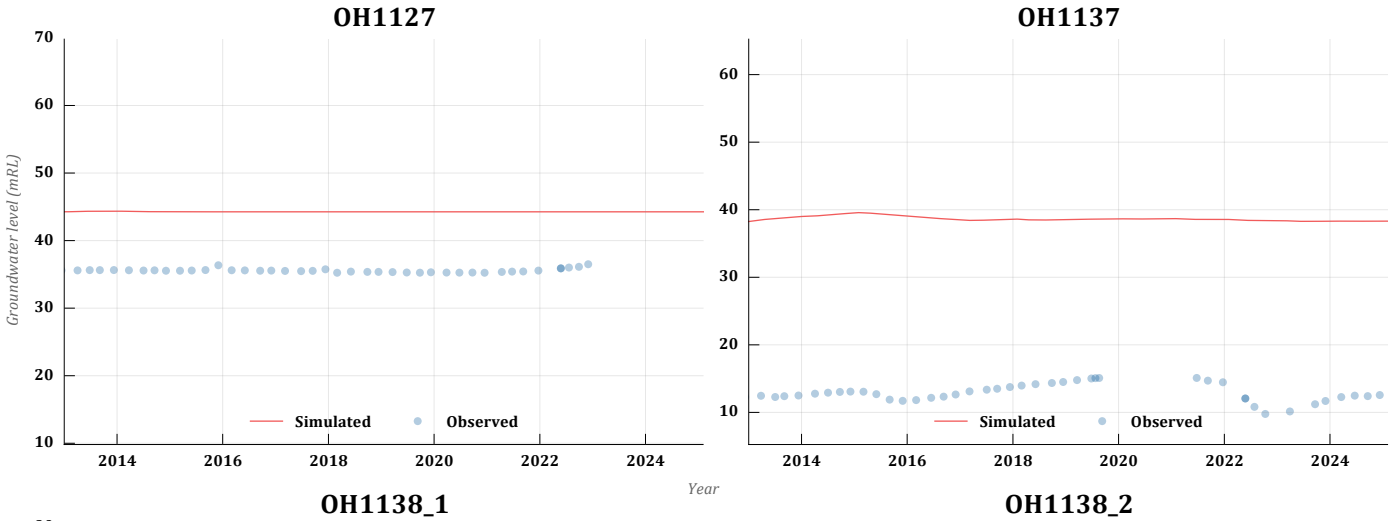

OH1123_3
Simulated
Observed
Year


OH1125_1
Groundwater level (mRL)
Simulated
Observed
Year

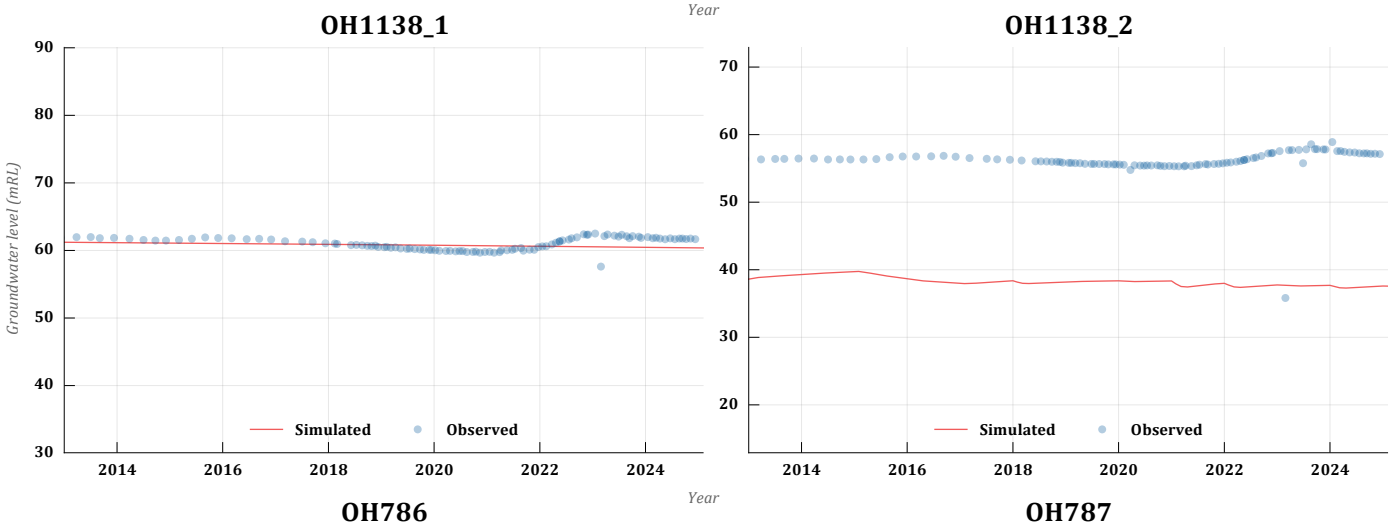

OH1125_2
Simulated
Observed
Year


OH1125_3
Groundwater level (mRL)
Simulated
Observed
Year

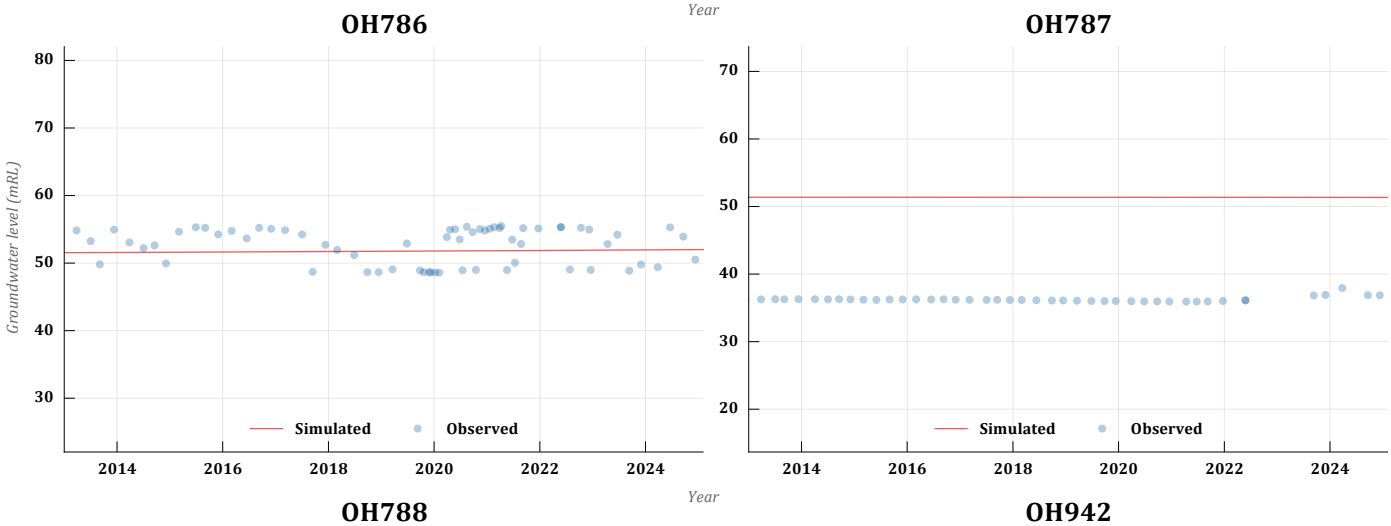

OH1126
Simulated
Observed
Year


OH1127
Groundwater level (mRL)
70
60
50
40
30
20
10
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

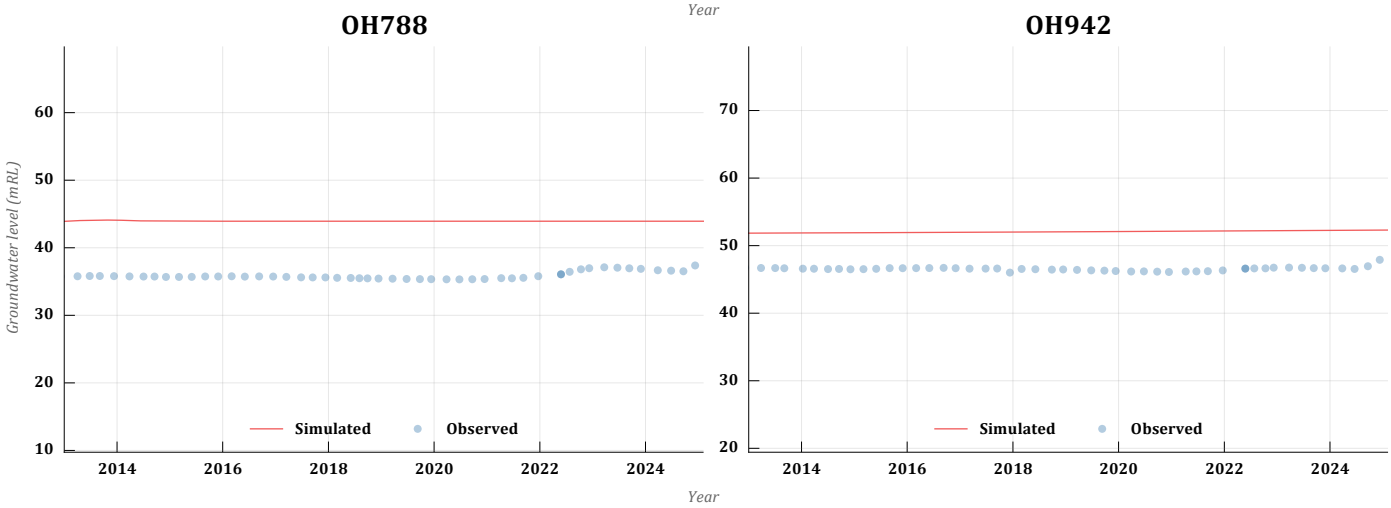
OH1137
60
50
40
30
20
10
Simulated
Observed
2014
2016
2018
2020
2022
2024


OH1138_1
Groundwater level (mRL)
90
80
70
60
50
40
30
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

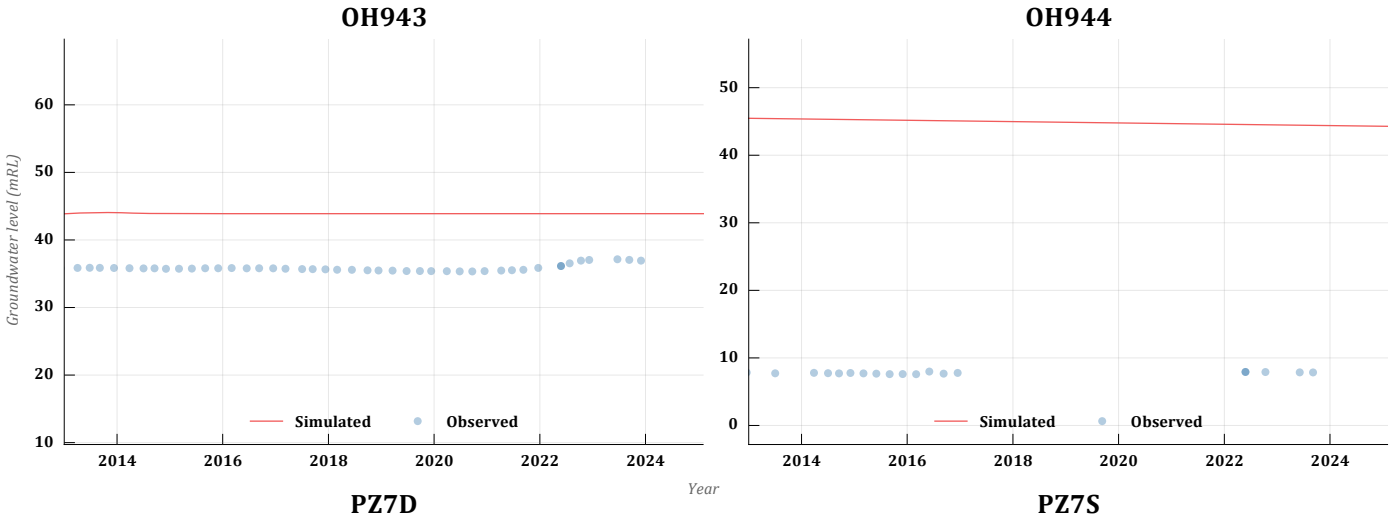
OH1138_2
70
60
50
40
30
20
Simulated
Observed
2014
2016
2018
2020
2022
2024


OH786
Groundwater level (mRL)
80
70
60
50
40
30
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

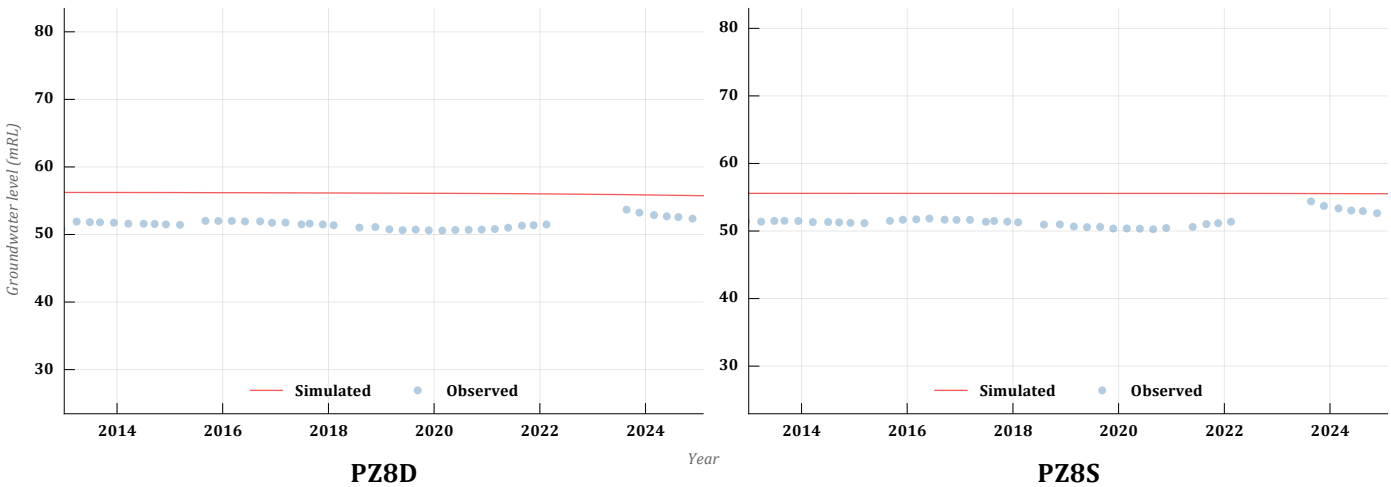
OH787
70
60
50
40
30
20
Simulated
Observed
2014
2016
2018
2020
2022
2024


OH788
Groundwater level (mRL)
60
50
40
30
20
10
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

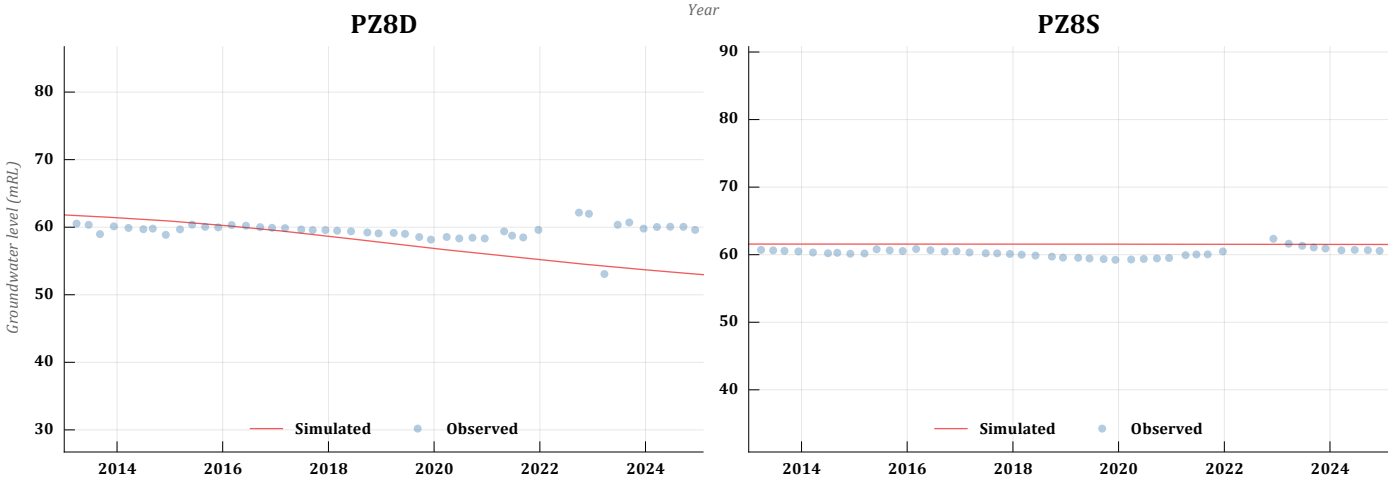
OH942
70
60
50
40
30
20
Simulated
Observed
2014
2016
2018
2020
2022
2024



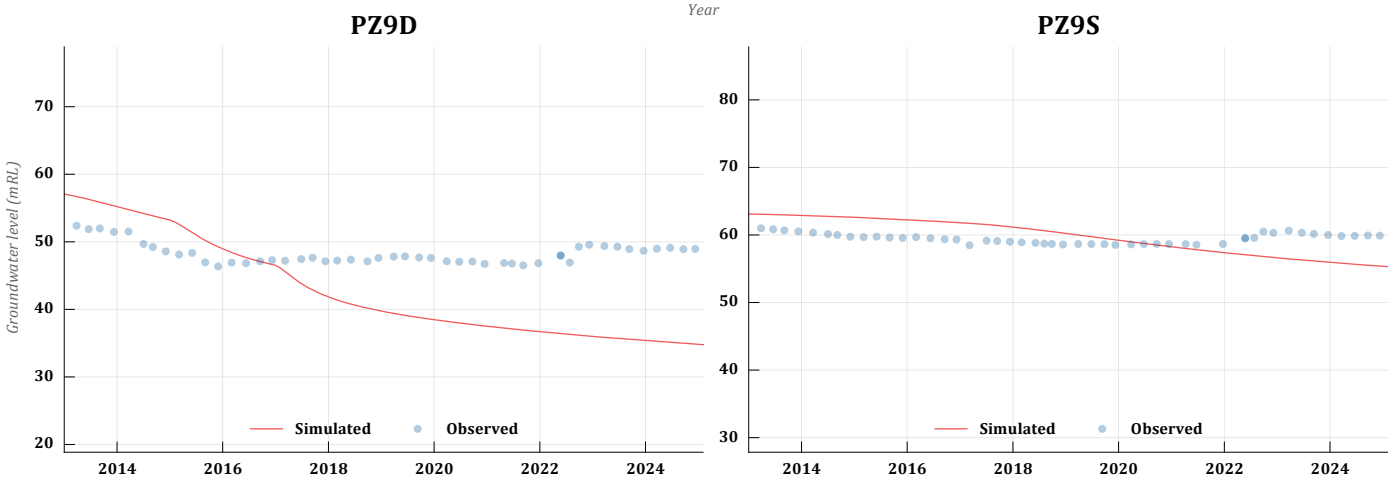
Year



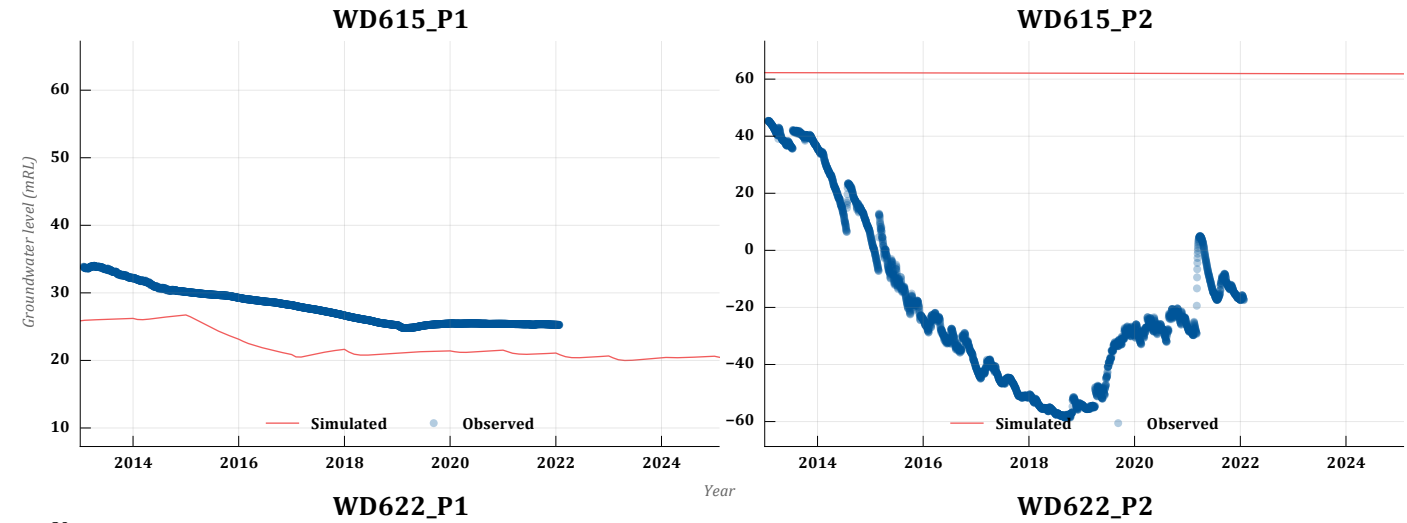
Year



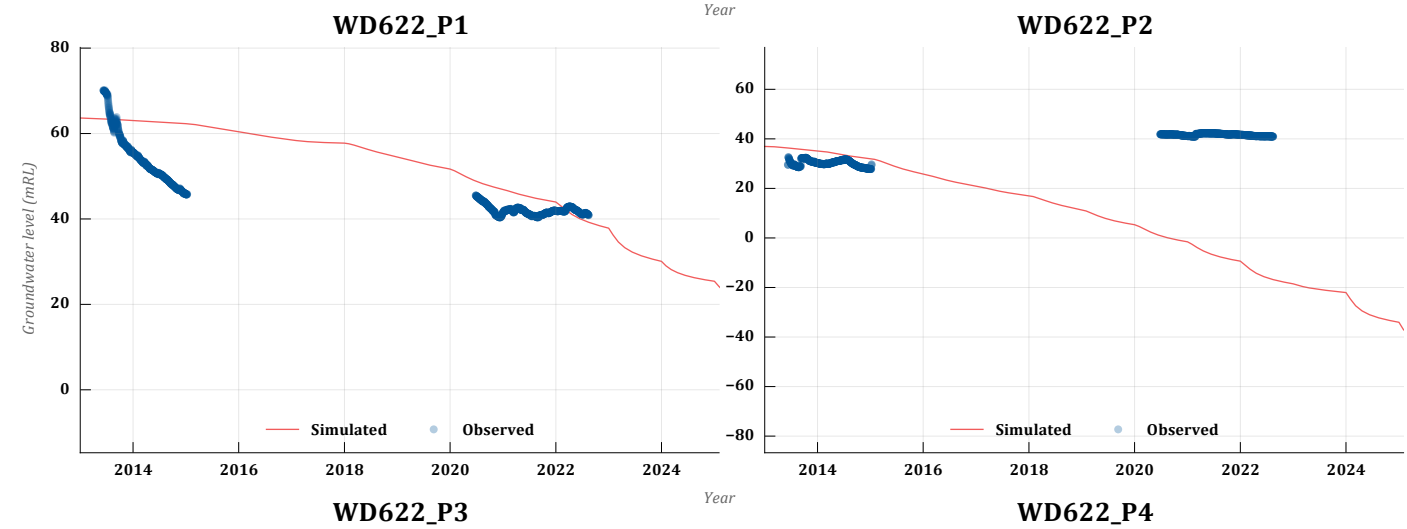
Year



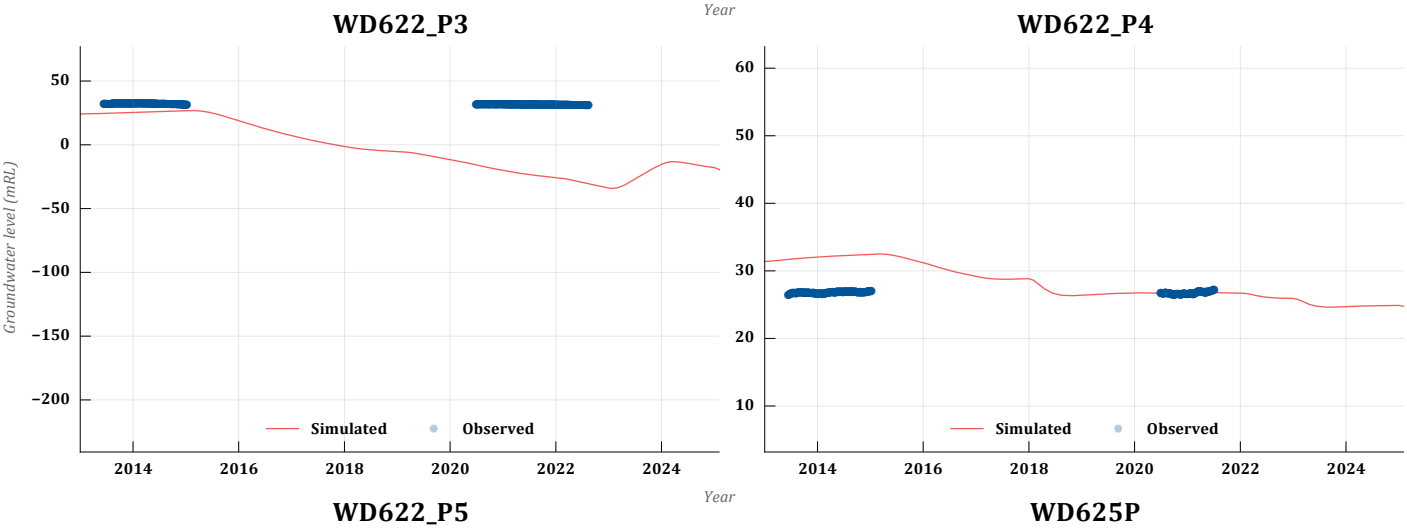
Year


WD615_P1
Groundwater level (mRL)
60
50
40
30
20
10
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

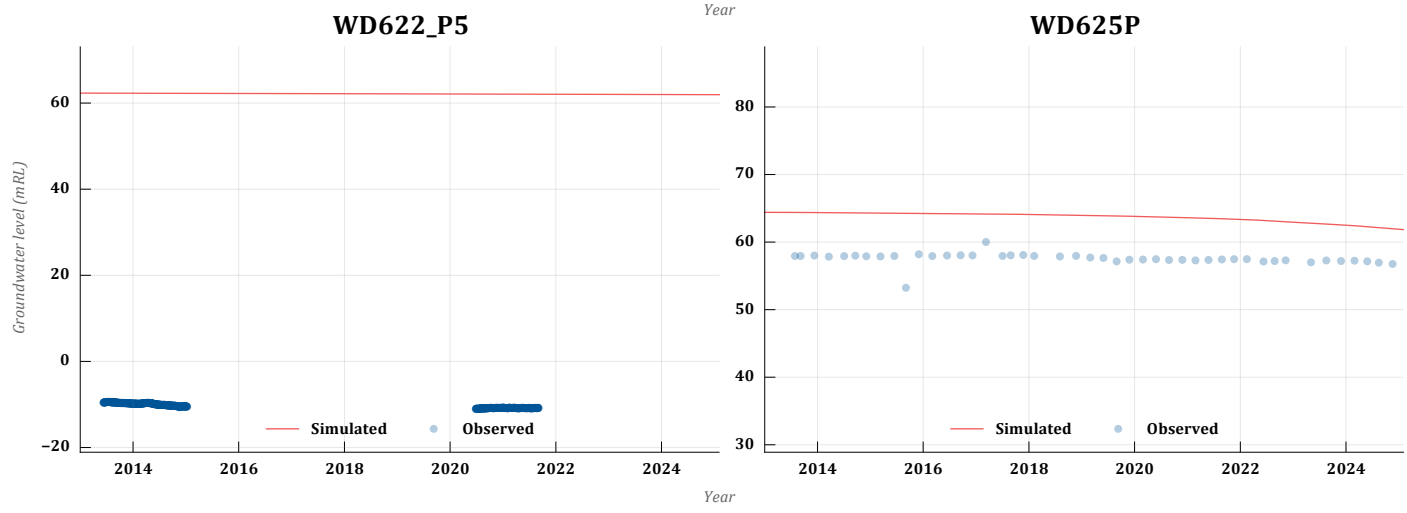
WD615_P2
60
40
20
0
−20
−40
−60
Simulated
Observed
2014
2016
2018
2020
2022
2024


WD622_P1
Groundwater level (mRL)
80
60
40
20
0
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

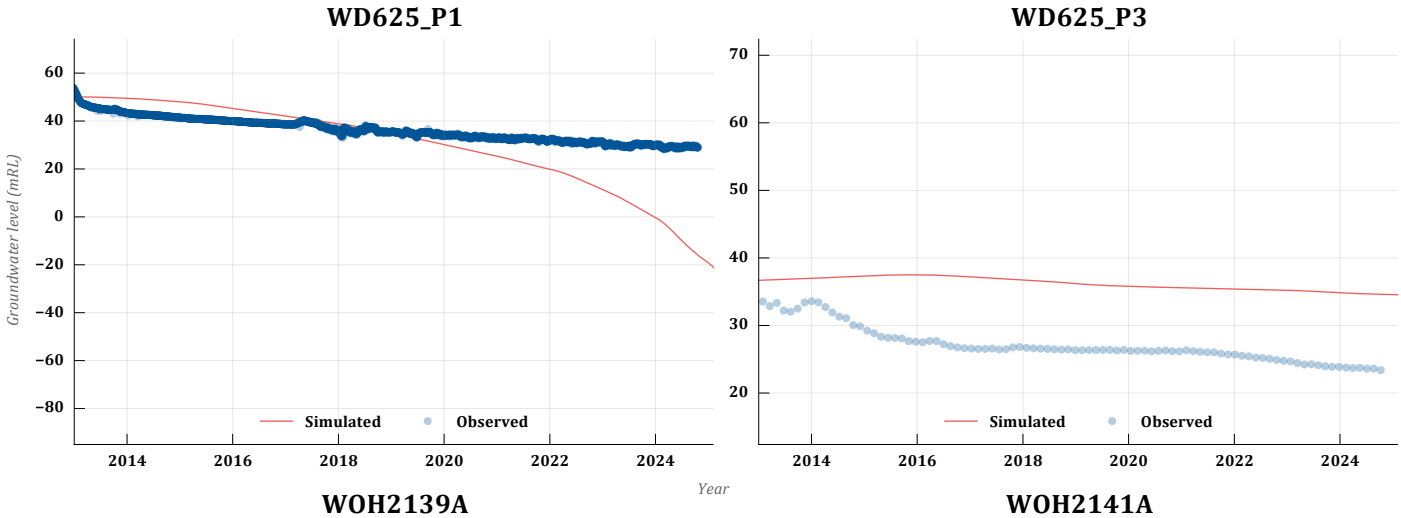
WD622_P2
60
40
20
0
−20
−40
−60
−80
Simulated
Observed
2014
2016
2018
2020
2022
2024


WD622_P3
Groundwater level (mRL)
50
0
−50
−100
−150
−200
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

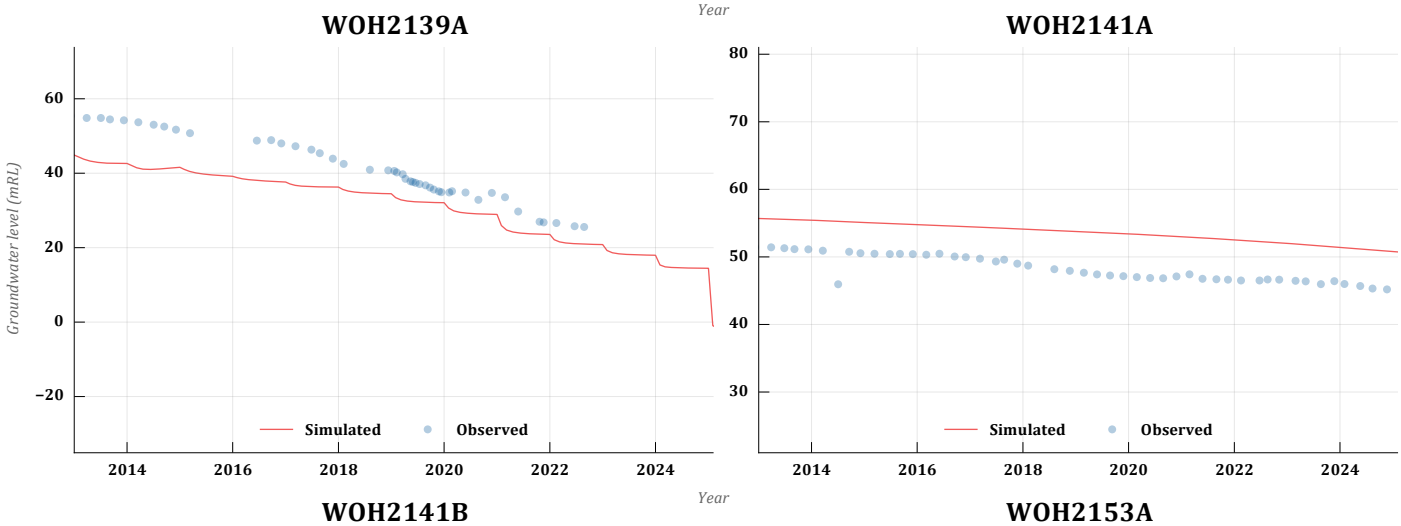
WD622_P4
60
50
40
30
20
10
Simulated
Observed
2014
2016
2018
2020
2022
2024


WD622_P5
Groundwater level (mRL)
60
40
20
0
−20
Simulated
Observed
2014
2016
2018
2020
2022
2024
Year

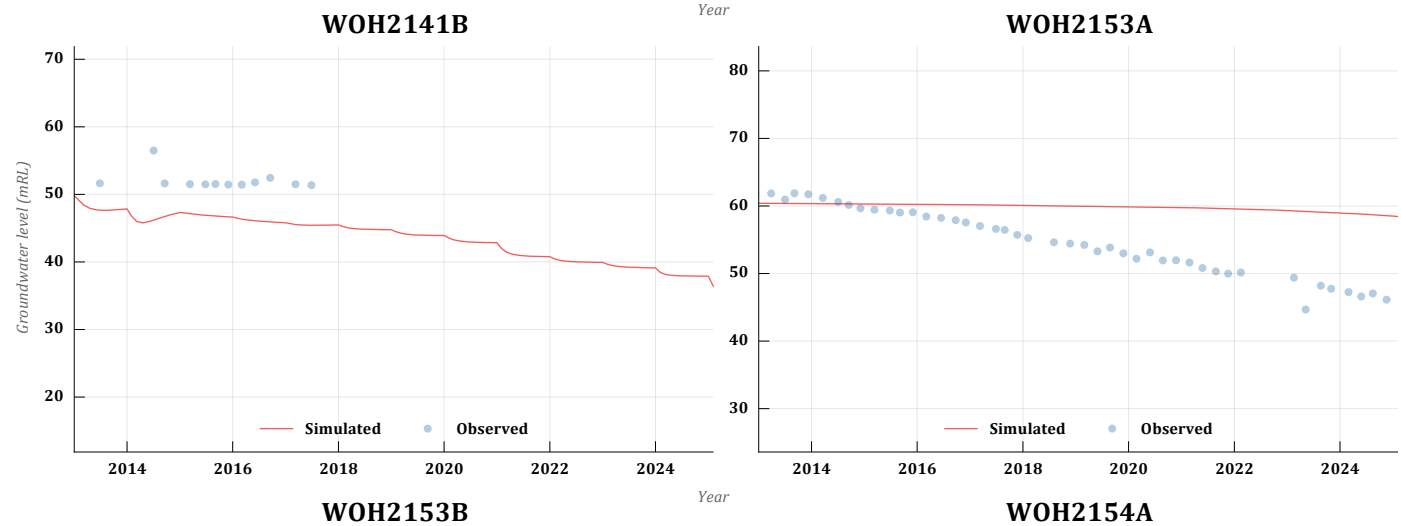
WD625P
80
70
60
50
40
30
Simulated
Observed
2014
2016
2018
2020
2022
2024



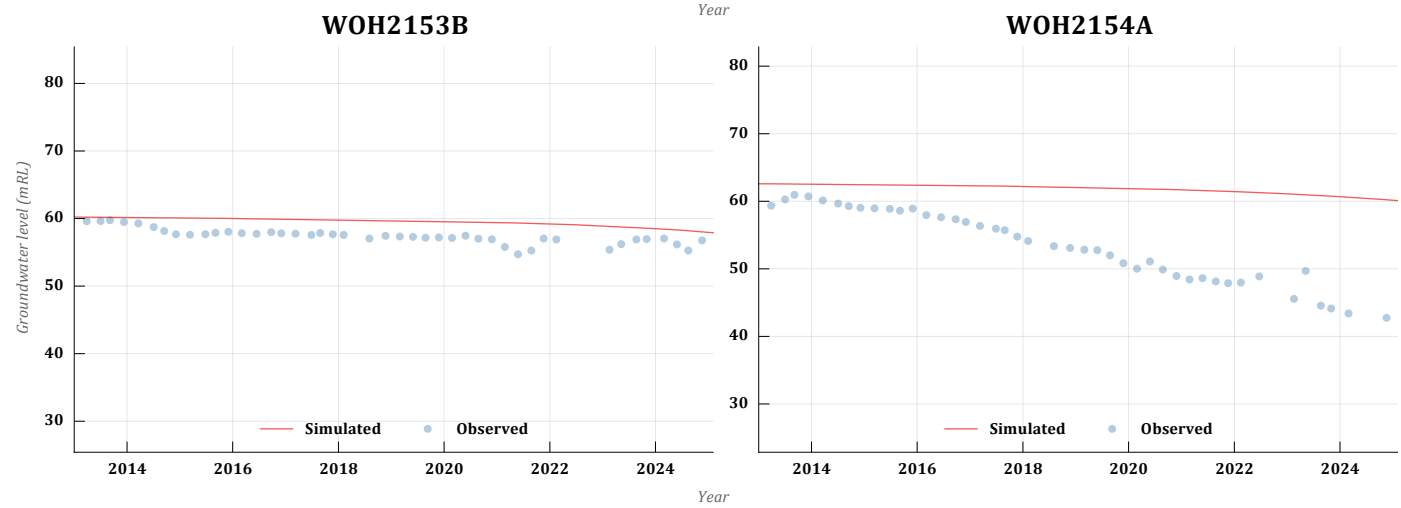
Year



Year

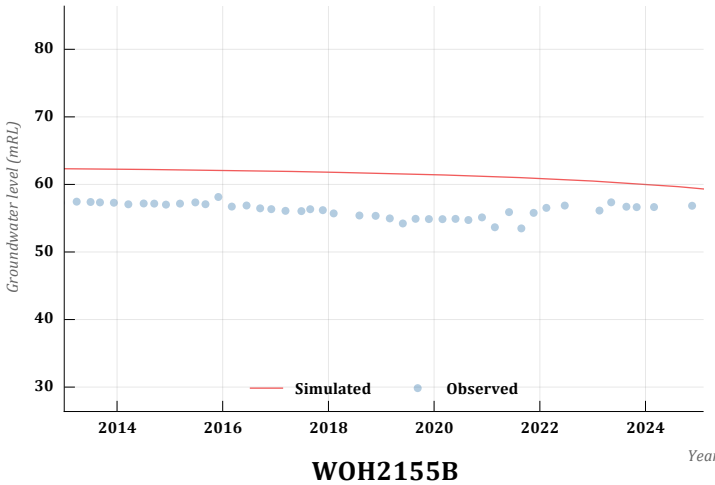


Year

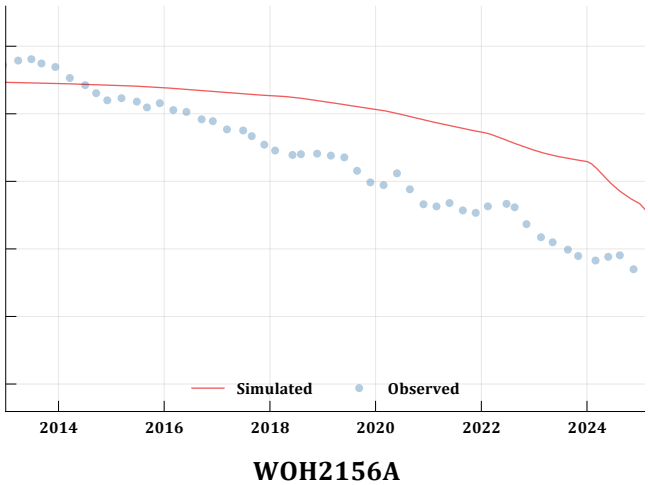


Year

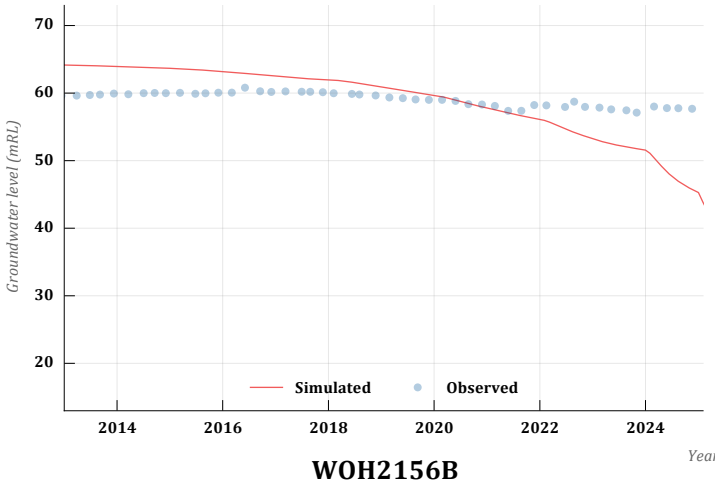
WOH2154B



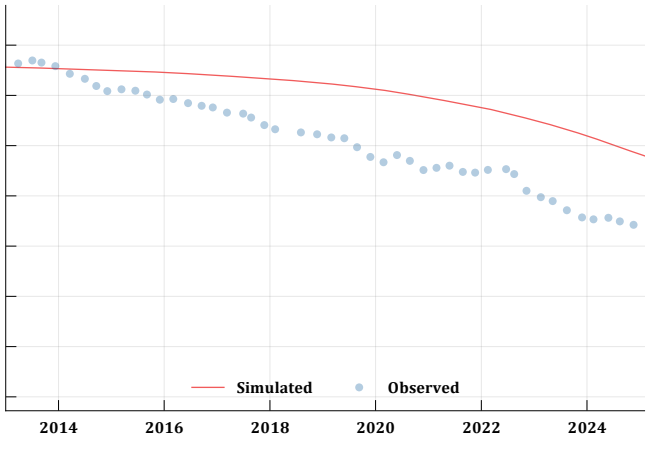
WOH2155A



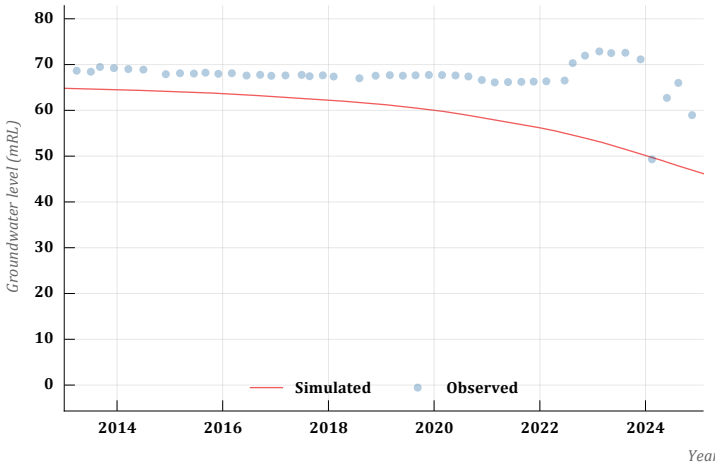
WOH2155B



WOH2156A



WOH2156B



Appendix D

VWP figures

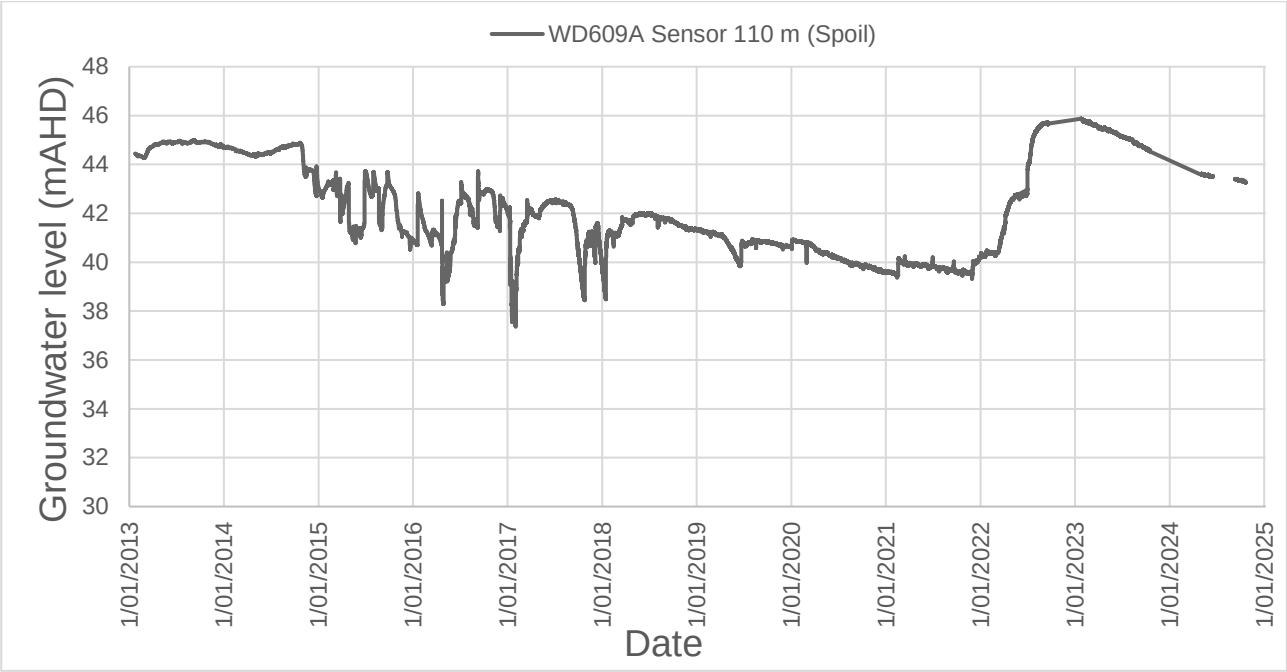


Figure D 1 VWP WD609A pressure head

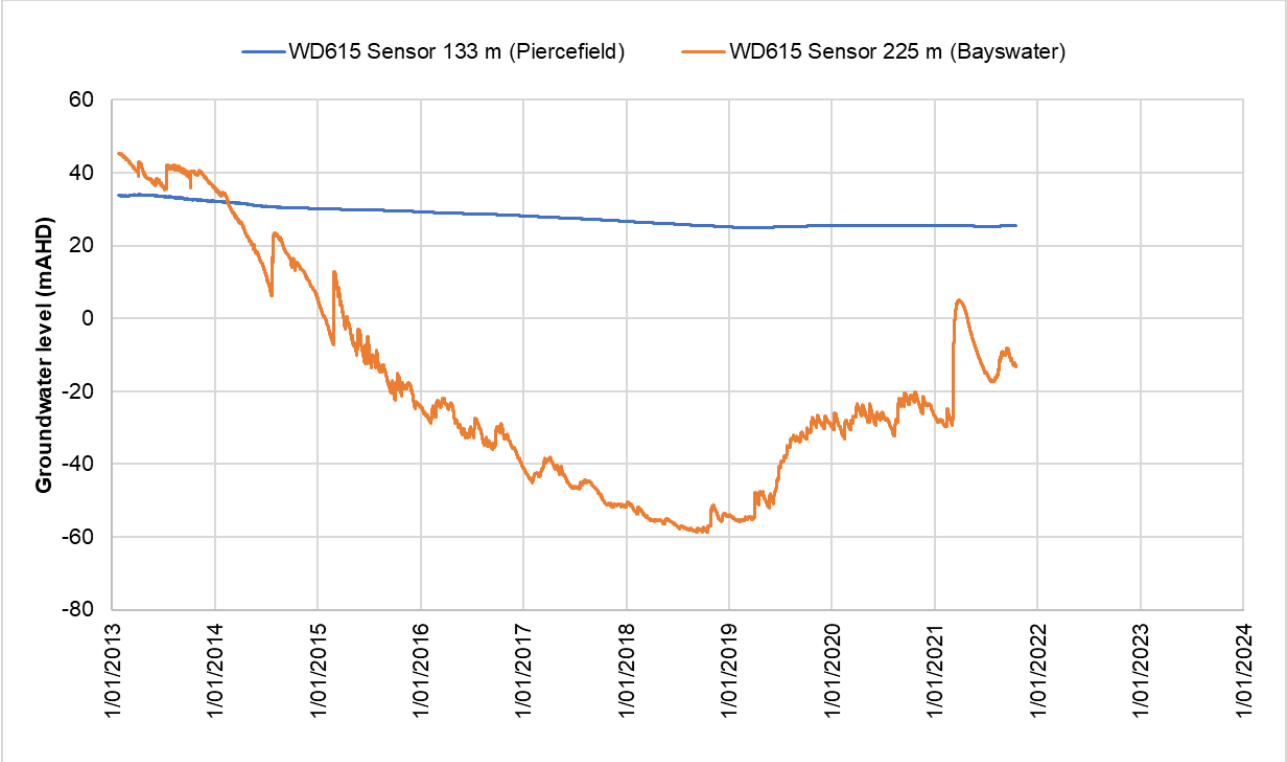


Figure D 2 VWP WD615 pressure heads

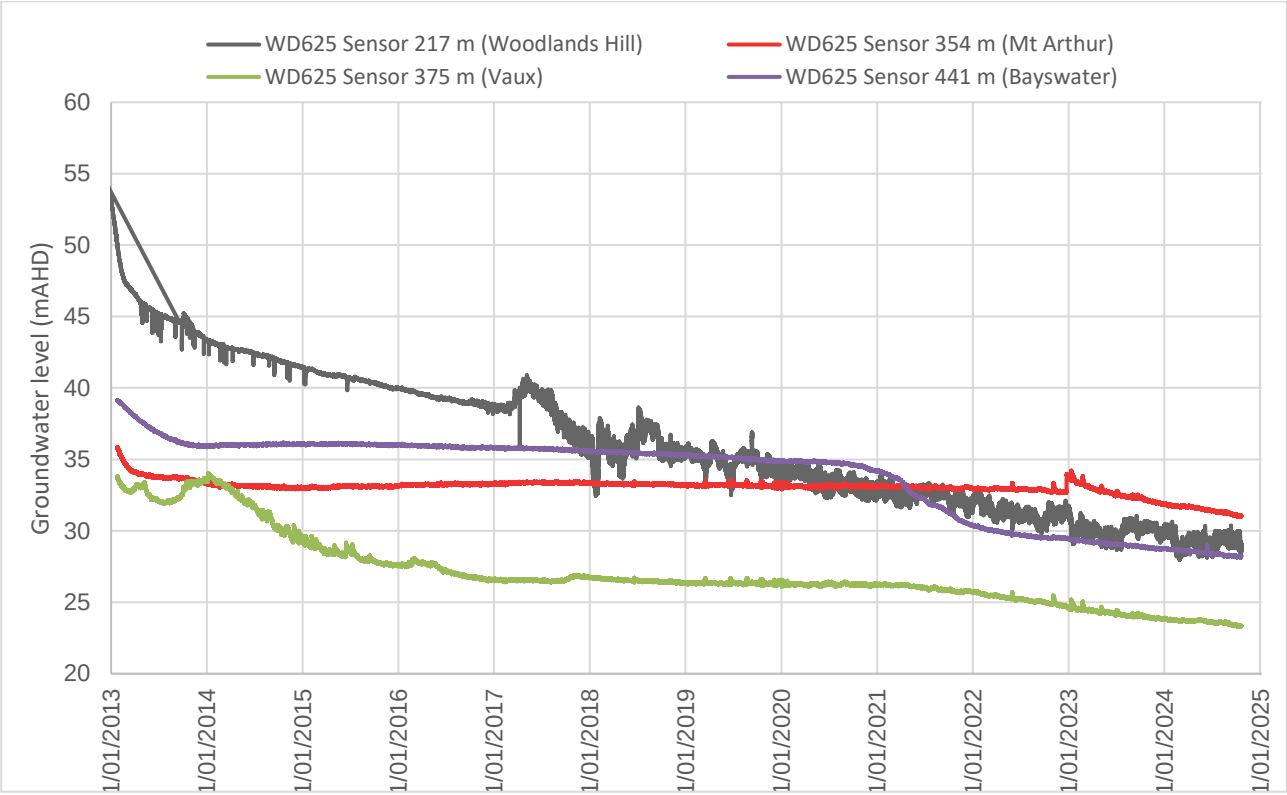


Figure D 3 VWP WD625 pressure heads

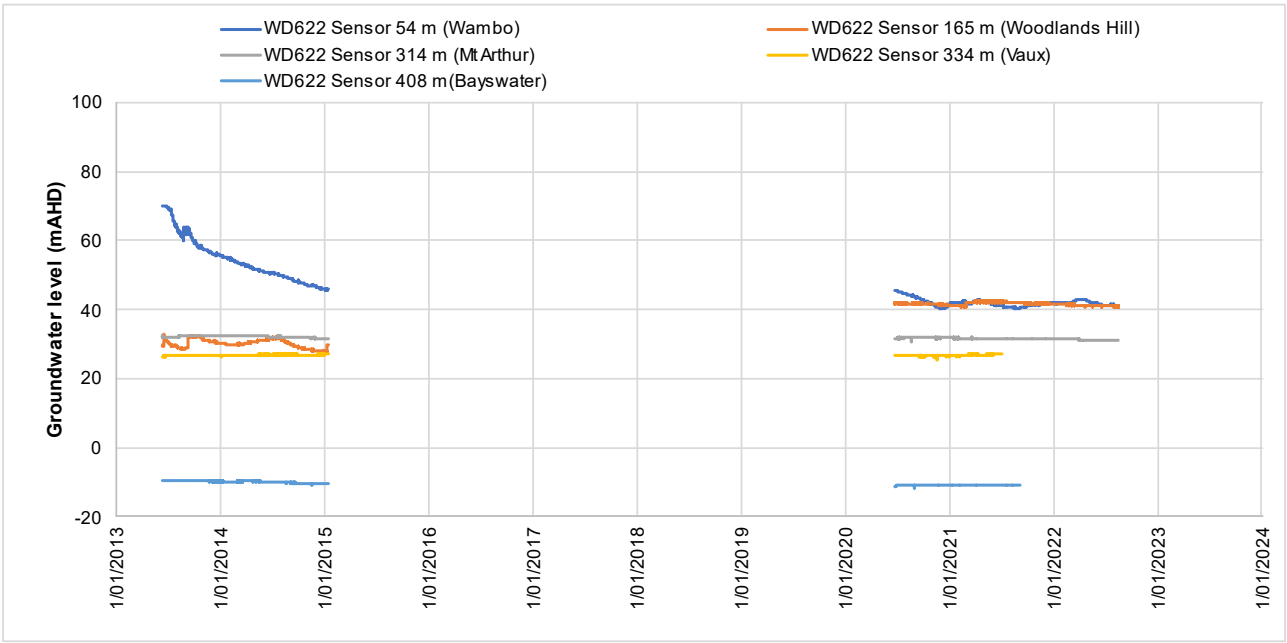


Figure D 4 VWP WD622 pressure heads

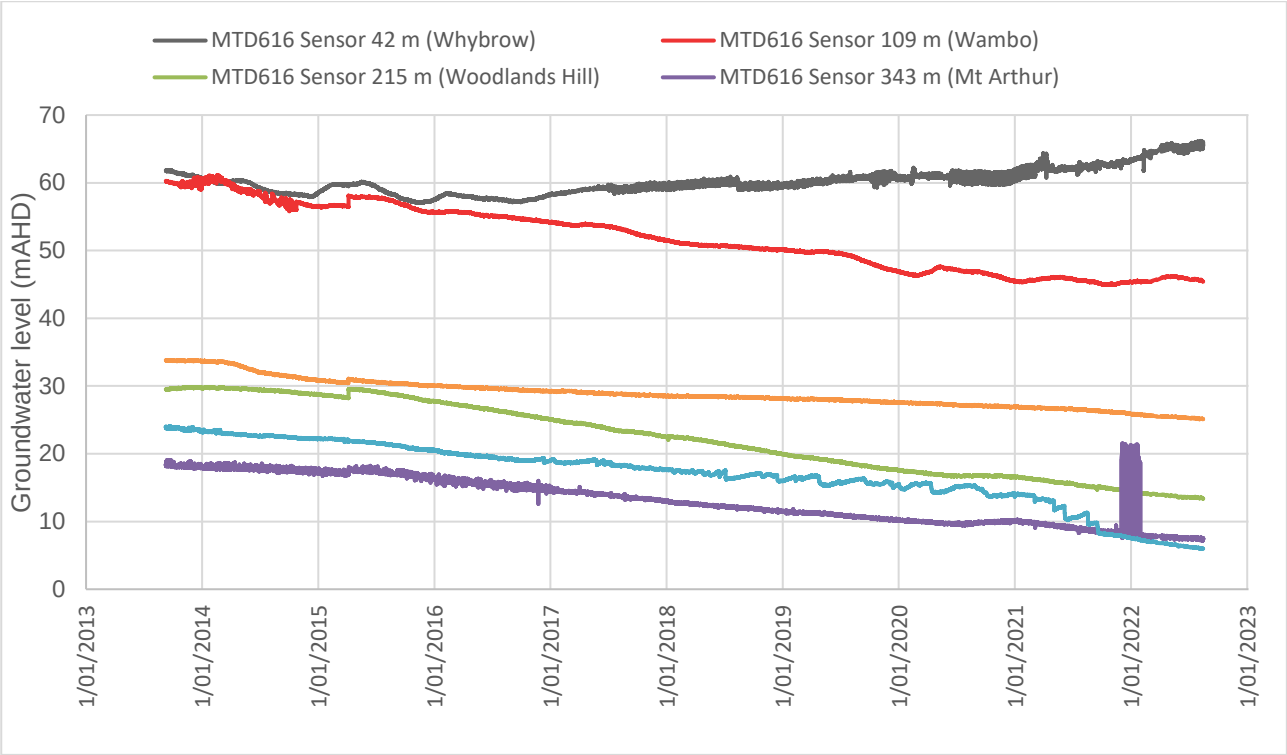


Figure D 5 VWP MTD616 pressure heads

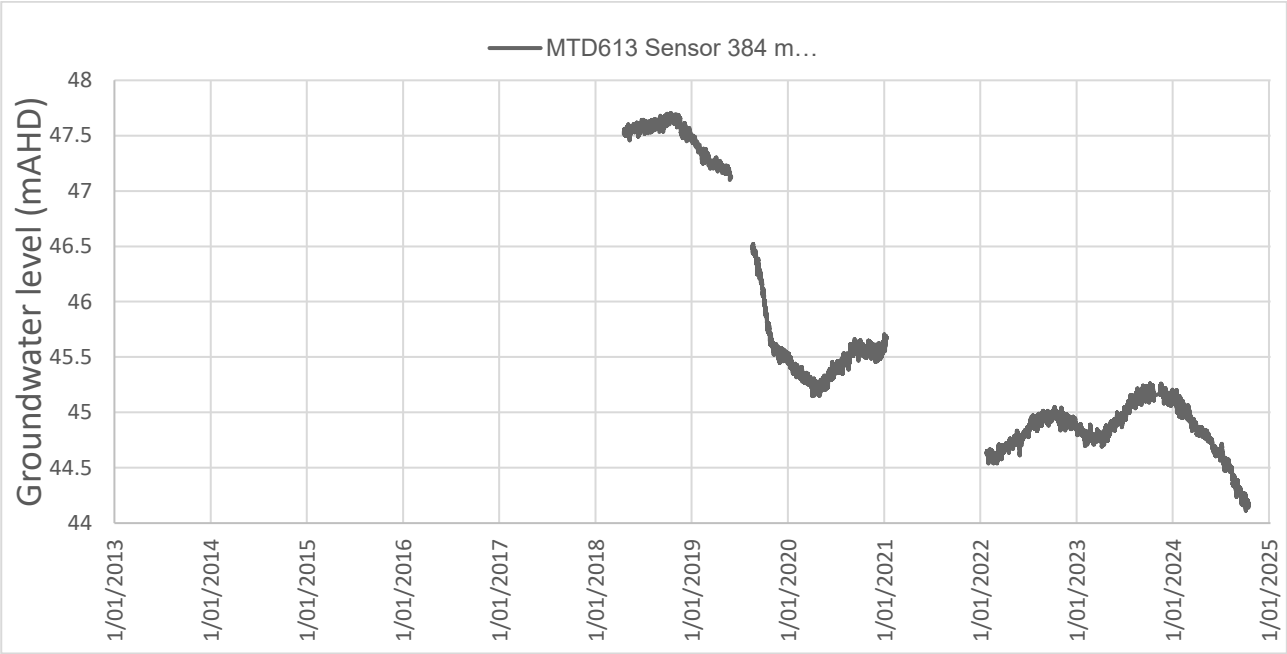


Figure D 6 VWP MTD613 pressure head

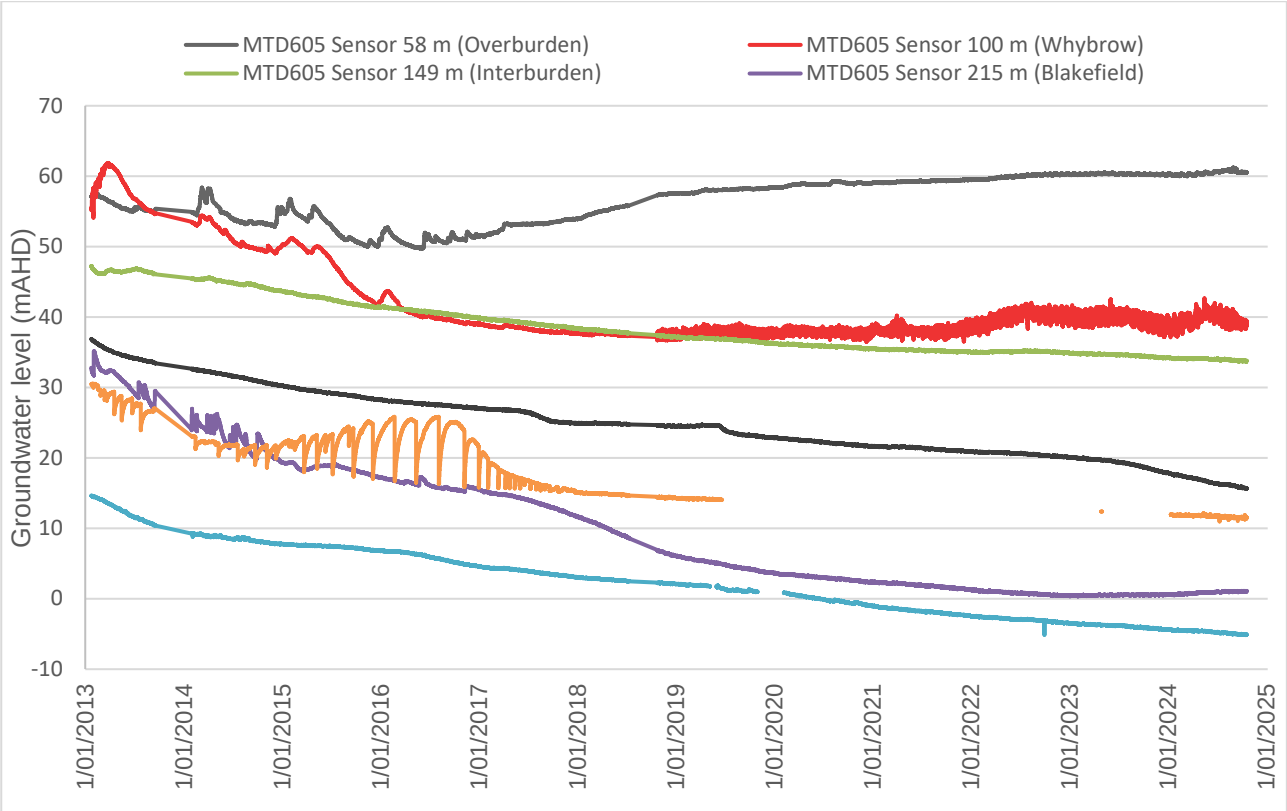


Figure D 7 VWP MTD605 pressure heads

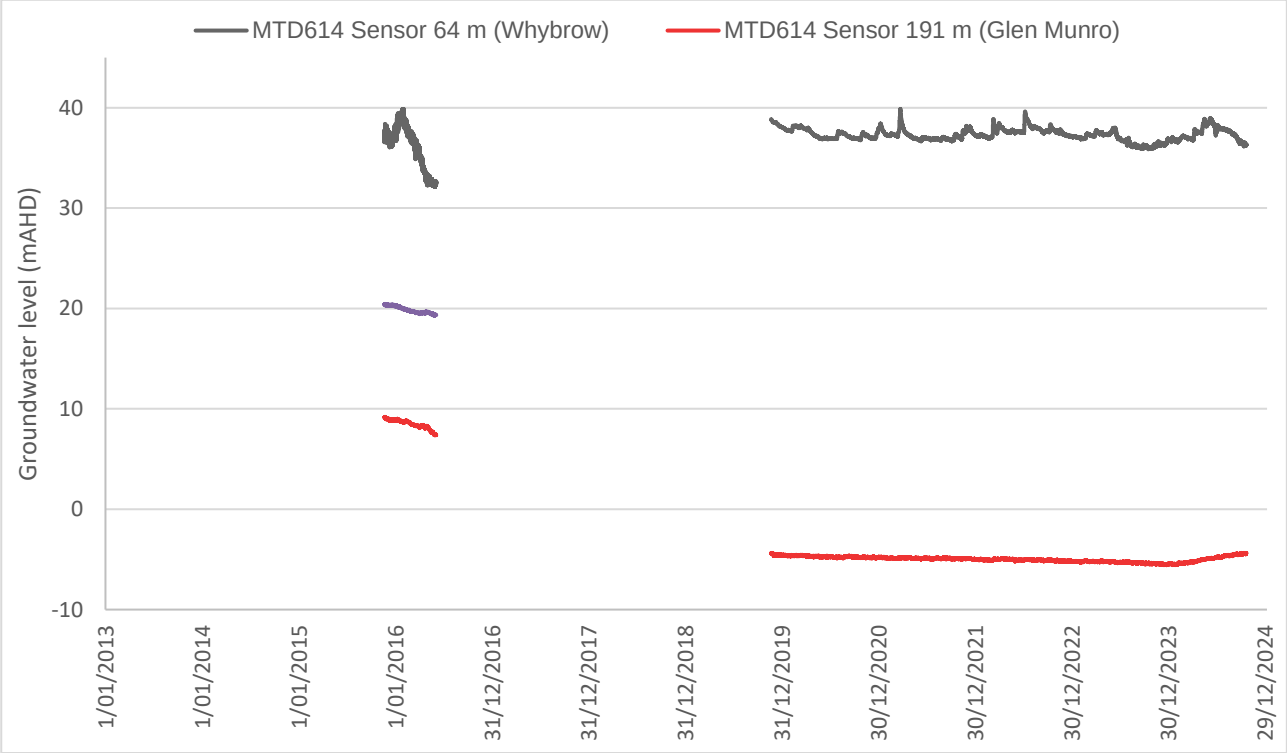


Figure D 8 VWP MTD614 pressure heads

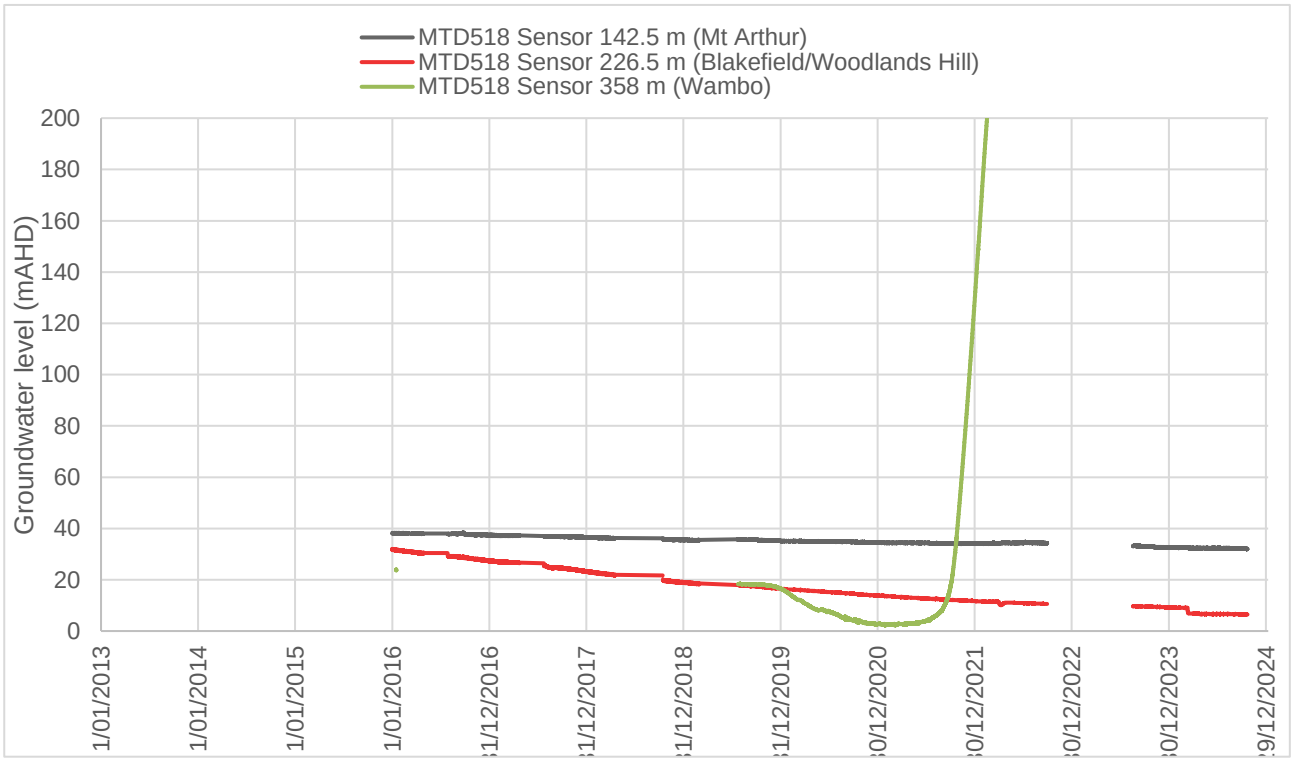


Figure D 9 VWP MTD518 pressure heads

Appendix E

Annual groundwater quality laboratory results

Table E 1 Annual groundwater quality laboratory results - 2024

Sample Point	Date	Time	EC Field (uS/cm (25TRef))	pH Field	RL Standing Water Level (m)	Water Temp (Deg C)	TDS - Total (mg/l)	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Acidity as CaCO3	SO4 - Total (mg/l)	Cl- (mg/l)	Ca - Total (mg/l)	Mg - Total (mg/l)	Na - Total (mg/l)
GW 9706	20/03/2024	1:15:00 PM	4,350	7.00	61.57	22	-	-	-	-	-	-	-	-	-	-	-
GW 9706	19/06/2024	10:10:00 AM	4,430	7.00	62.22	21.9	-	<1	<1	504	504	-	869	627	124	101	826
GW 9706	19/09/2024	11:05:00 AM	4,540	7.00	62.12	18.5	-	-	-	-	-	-	-	-	-	-	-
GW 9706	5/12/2024	1:45:00 PM	4,270	6.90	61.76	22.4	-	-	-	-	-	-	-	-	-	-	-
GW 9707	26/03/2024	10:20:00 AM	20,700	6.70	59.08	23	-	-	-	-	-	-	-	-	-	-	-
GW 9707	19/06/2024	11:00:00 AM	19,650	6.80	59.66	18.6	-	<1	<1	601	601	-	5,180	4,880	552	747	3,970
GW 9707	19/09/2024	10:10:00 AM	18,560	7.00	59.78	18.7	-	-	-	-	-	-	-	-	-	-	-
GW 9707	10/12/2024	9:00:00 AM	19,320	6.80	59.49	18.8	-	-	-	-	-	-	-	-	-	-	-
GW 9708	26/03/2024	9:20:00 AM	13,480	6.70	61.44	20.2	-	-	-	-	-	-	-	-	-	-	-
GW 9708	19/06/2024	11:20:00 AM	12,470	6.80	61.8	22	-	<1	<1	685	685	-	4,720	1,680	520	490	2,440
GW 9708	19/09/2024	9:30:00 AM	12,410	6.80	61.86	18.7	-	-	-	-	-	-	-	-	-	-	-
GW 9708	9/12/2024	12:30:00 PM	12,650	6.70	61.57	18	-	-	-	-	-	-	-	-	-	-	-
GW 9709	20/03/2024	11:50:00 AM	22,200	6.70	51.13	22.2	-	-	-	-	-	-	-	-	-	-	-
GW 9709	19/06/2024	8:30:00 AM	21,000	6.70	51.13	18.6	-	<1	<1	809	809	-	5,660	5,020	607	806	4,110
GW 9709	19/09/2024	9:00:00 AM	20,900	6.70	51.23	20.1	-	-	-	-	-	-	-	-	-	-	-
GW 9709	10/12/2024	8:30:00 AM	21,500	7.00	51.03	19.4	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 1	26/03/2024	9:00:00 AM	6,690	7.20	67.65	19.9	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 1	19/06/2024	11:15:00 AM	5,720	7.40	67.75	18.5	-	<1	<1	918	918	-	812	825	56	89	1,240
GW98 MTCL 1	19/09/2024	9:15:00 AM	5,500	7.20	67.38	19.6	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 1	10/12/2024	8:40:00 AM	5,550	7.30	66.94	18.3	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 2	20/03/2024	12:20:00 PM	15,440	6.70	69.49	20	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 2	19/06/2024	9:00:00 AM	15,250	6.70	69.52	19.1	-	<1	<1	641	641	-	4,270	3,380	627	570	2,780
GW98 MTCL 2	19/09/2024	10:25:00 AM	15,100	6.70	69.67	19.4	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 2	5/12/2024	1:10:00 PM	15,070	6.60	69.71	19	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01D	7/02/2024	11:25:00 AM	3,960	6.00	56.963	19.4	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01D	21/05/2024	8:35:00 AM	3,850	6.10	57.943	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01D	14/08/2024	11:00:00 AM	3,440	6.20	57.643	-	-	<1	<1	34	34	-	107	910	108	72	434
MB15MTW01D	21/11/2024	11:40:00 AM	3,950	6.20	57.303	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01S	1/02/2024	2:00:00 PM	2,850	6.30	57.188	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01S	21/05/2024	8:10:00 AM	1,542	6.30	58.128	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01S	14/08/2024	10:40:00 AM	1,749	6.40	57.858	-	-	<1	<1	56	56	-	50	486	39	40	193
MB15MTW01S	21/11/2024	11:15:00 AM	2,300	6.30	57.418	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02D	7/02/2024	10:50:00 AM	12,120	7.60	56.661	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02D	21/05/2024	11:25:00 AM	12,010	7.60	56.731	22.6	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02D	14/08/2024	8:50:00 AM	13,110	7.70	56.731	20.9	-	<1	<1	1,400	1400	-	<10	3,300	39	26	3,010
MB15MTW02D	21/11/2024	12:30:00 PM	12,970	7.70	56.601	17.5	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02S	7/02/2024	10:40:00 AM	2,770	6.70	56.12	20.1	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02S	21/05/2024	11:10:00 AM	2,740	6.70	57.12	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02S	14/08/2024	8:30:00 AM	2,620	6.70	56.89	-	-	<1	<1	184	184	-	12	687	39	33	416
MB15MTW02S	21/11/2024	12:15:00 PM	2,580	6.60	56.33	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW03	7/02/2024	9:40:00 AM	12,310	6.90	55.317	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW03	21/05/2024	12:00:00 PM	12,370	6.90	55.377	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW03	14/08/2024	1:00:00 PM	11,970	6.90	55.427	-	-	<1	<1	923	923	-	380	3,590	249	227	2,310
MB15MTW03	12/11/2024	1:00:00 PM	12,340	6.90	55.327	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW04	1/02/2024	8:50:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW04	20/05/2024	8:40:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW04	13/08/2024	9:30:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW04	21/11/2024	10:00:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW05	1/02/2024	8:25:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW05	20/05/2024	8:20:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW05	13/08/2024	9:15:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW05	21/11/2024	10:15:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW06	7/02/2024	8:35:00 AM	126	5.90	Top RL not provided	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW06	21/05/2024	2:25:00 PM	101	6.20	Top RL not provided	-	-	-	-	-	-	-	-	-	-	-	-

Table E 1 Annual groundwater quality laboratory results - 2024 Continued

Sample Point	Date	Time	K - Total (mg/l)	Al - Total (mg/l)	As - Total (mg/l)	Cd - Total (mg/l)	Cu - Total (mg/l)	Pb - Total (mg/l)	Ni - Total (mg/l)	Se (mg/l)	Zn - Total (mg/l)	B (mg/l)	Hg - Total (mg/l)	Mo (mg/l)	V (mg/l)	Cr (mg/l)	Total anions	Total Cations	Ionic Balance
GW 9706	20/03/2024	1:15:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9706	19/06/2024	10:10:00 AM	13	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.005	0.14	<0.0001	----	----	----	45.8	50.8	5.08
GW 9706	19/09/2024	11:05:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9706	5/12/2024	1:45:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9707	26/03/2024	10:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9707	19/06/2024	11:00:00 AM	21	0.04	<0.001	0.0002	0.001	<0.001	0.009	<0.01	0.005	0.38	<0.0001	----	----	----	258	262	0.91
GW 9707	19/09/2024	10:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9707	10/12/2024	9:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9708	26/03/2024	9:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9708	19/06/2024	11:20:00 AM	24	0.07	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.005	0.27	<0.0001	----	----	----	159	173	4.11
GW 9708	19/09/2024	9:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9708	9/12/2024	12:30:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9709	20/03/2024	11:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9709	19/06/2024	8:30:00 AM	22	0.06	<0.001	<0.0001	0.003	<0.001	0.006	<0.01	0.013	0.31	<0.0001	----	----	----	276	276	0.06
GW 9709	19/09/2024	9:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW 9709	10/12/2024	8:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 1	26/03/2024	9:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 1	19/06/2024	11:15:00 AM	18	0.06	<0.001	<0.0001	<0.001	<0.001	0.002	0.02	0.009	0.16	<0.0001	----	----	----	58.5	64.5	4.87
GW98 MTCL 1	19/09/2024	9:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 1	10/12/2024	8:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 2	20/03/2024	12:20:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 2	19/06/2024	9:00:00 AM	42	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.005	0.21	<0.0001	----	----	----	197	200	0.79
GW98 MTCL 2	19/09/2024	10:25:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GW98 MTCL 2	5/12/2024	1:10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01D	7/02/2024	11:25:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01D	21/05/2024	8:35:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01D	14/08/2024	11:00:00 AM	8	0.09	<0.001	<0.0001	<0.001	<0.001	0.004	<0.01	0.028	<0.05	<0.0001	-	-	-	28.6	30.4	3.09
MB15MTW01D	21/11/2024	11:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01S	1/02/2024	2:00:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01S	21/05/2024	8:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW01S	14/08/2024	10:40:00 AM	5	0.02	0.002	<0.0001	<0.001	<0.001	0.003	<0.01	0.01	<0.05	<0.0001	-	-	-	15.9	13.8	7.12
MB15MTW01S	21/11/2024	11:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02D	7/02/2024	10:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02D	21/05/2024	11:25:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02D	14/08/2024	8:50:00 AM	9	0.34	<0.001	<0.0001	0.002	<0.001	0.002	<0.01	0.027	0.23	<0.0001	-	-	-	121	135	5.53
MB15MTW02D	21/11/2024	12:30:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02S	7/02/2024	10:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02S	21/05/2024	11:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW02S	14/08/2024	8:30:00 AM	6	<0.01	0.001	<0.0001	<0.001	<0.001	0.004	<0.01	0.013	<0.05	<0.0001	-	-	-	23.3	22.9	0.85
MB15MTW02S	21/11/2024	12:15:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW03	7/02/2024	9:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW03	21/05/2024	12:00:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW03	14/08/2024	1:00:00 PM	20	0.06	<0.001	<0.0001	<0.001	<0.001	0.004	<0.01	<0.005	0.1	<0.0001	-	-	-	128	132	1.72
MB15MTW03	12/11/2024	1:00:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW04	1/02/2024	8:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW04	20/05/2024	8:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW04	13/08/2024	9:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW04	21/11/2024	10:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW05	1/02/2024	8:25:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW05	20/05/2024	8:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW05	13/08/2024	9:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW05	21/11/2024	10:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW06	7/02/2024	8:35:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW06	21/05/2024	2:25:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table E 1 Annual groundwater quality laboratory results - 2024 Continued

Sample Point	Date	Time	EC Field (uS/cm (25TRef))	pH Field	RL Standing Water Level (m)	Water Temp (Deg C)	TDS - Total (mg/l)	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Acidity as CaCO3	SO4 - Total (mg/l)	Cl- (mg/l)	Ca - Total (mg/l)	Mg - Total (mg/l)	Na - Total (mg/l)
MB15MTW06	15/08/2024	10:10:00 AM	110	6.10	Top RL not provided	-	-	<1	<1	23	23	-	6	14	4	<1	16
MB15MTW06	21/11/2024	9:00:00 AM	115	6.00	Top RL not provided	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW07	1/02/2024	10:05:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW07	20/05/2024	9:55:00 AM	-	-	dry	18.9	-	-	-	-	-	-	-	-	-	-	-
MB15MTW07	13/08/2024	11:10:00 AM	-	-	dry	20.1	-	-	-	-	-	-	-	-	-	-	-
MB15MTW07	18/11/2024	1:15:00 PM	-	-	dry	19.3	-	-	-	-	-	-	-	-	-	-	-
MB15MTW08	1/02/2024	9:45:00 AM	-	-	dry	20.3	-	-	-	-	-	-	-	-	-	-	-
MB15MTW08	20/05/2024	9:30:00 AM	-	-	dry	21.6	-	-	-	-	-	-	-	-	-	-	-
MB15MTW08	13/08/2024	11:00:00 AM	-	-	dry	20.9	-	-	-	-	-	-	-	-	-	-	-
MB15MTW08	18/11/2024	1:05:00 PM	-	-	dry	20.9	-	-	-	-	-	-	-	-	-	-	-
MB15MTW09	1/02/2024	9:35:00 AM	-	-	dry	20.6	-	-	-	-	-	-	-	-	-	-	-
MB15MTW09	21/05/2024	1:20:00 PM	-	-	dry	20.6	-	-	-	-	-	-	-	-	-	-	-
MB15MTW09	13/08/2024	10:35:00 AM	-	-	Top RL not provided	21.6	-	-	-	-	-	-	-	-	-	-	-
MB15MTW09	18/11/2024	1:00:00 PM	-	-	dry	21.5	-	-	-	-	-	-	-	-	-	-	-
MB15MTW10	1/02/2024	9:55:00 AM	-	-	dry	21.7	-	-	-	-	-	-	-	-	-	-	-
MB15MTW10	20/05/2024	9:50:00 AM	-	-	dry	22	-	-	-	-	-	-	-	-	-	-	-
MB15MTW10	13/08/2024	11:20:00 AM	-	-	dry	23.3	-	-	-	-	-	-	-	-	-	-	-
MB15MTW10	18/11/2024	1:20:00 PM	-	-	dry	21.2	-	-	-	-	-	-	-	-	-	-	-
MB15MTW11	1/02/2024	9:10:00 AM	-	-	dry	22.1	-	-	-	-	-	-	-	-	-	-	-
MB15MTW11	28/05/2024	9:10:00 AM	-	-	dry	20.9	-	-	-	-	-	-	-	-	-	-	-
MB15MTW11	13/08/2024	10:10:00 AM	-	-	dry	20.7	-	-	-	-	-	-	-	-	-	-	-
MB15MTW11	21/11/2024	10:30:00 AM	-	-	dry	19	-	-	-	-	-	-	-	-	-	-	-
MBW01	7/02/2024	1:10:00 PM	10,500	7.40	57.44	20.9	-	-	-	-	-	-	-	-	-	-	-
MBW01	20/05/2024	12:45:00 PM	10,050	7.40	57.35	20.8	-	-	-	-	-	-	-	-	-	-	-
MBW01	15/08/2024	11:20:00 AM	9,520	7.40	57.36	20.9	-	<1	<1	720	720	-	236	2,810	34	96	1,940
MBW01	21/11/2024	12:50:00 PM	11,860	7.30	57.28	20.6	-	-	-	-	-	-	-	-	-	-	-
MBW02	1/02/2024	12:35:00 PM	9,760	7.20	55.2	22.3	-	-	-	-	-	-	-	-	-	-	-
MBW02	20/05/2024	12:10:00 PM	10,110	7.20	55.07	20.6	-	-	-	-	-	-	-	-	-	-	-
MBW02	13/08/2024	1:30:00 PM	10,090	7.20	55.08	18.2	-	<1	<1	1,610	1610	-	<10	2,290	59	35	2,200
MBW02	12/11/2024	11:15:00 AM	10,140	7.20	54.98	20.8	-	-	-	-	-	-	-	-	-	-	-
MBW03	1/02/2024	12:30:00 PM	728	6.90	55.27	20.2	-	-	-	-	-	-	-	-	-	-	-
MBW03	20/05/2024	12:20:00 PM	8,830	7.20	54.99	20	-	-	-	-	-	-	-	-	-	-	-
MBW03	13/08/2024	2:00:00 PM	9,030	7.30	54.95	19.5	-	<1	<1	2,280	2280	-	<10	1,690	26	20	2,110
MBW03	12/11/2024	11:30:00 AM	9,340	7.20	54.9	22.4	-	-	-	-	-	-	-	-	-	-	-
MBW04	1/02/2024	1:00:00 PM	10,310	7.20	47.99	17.8	-	-	-	-	-	-	-	-	-	-	-
MBW04	20/05/2024	12:30:00 PM	13,400	7.30	48.14	-	-	-	-	-	-	-	-	-	-	-	-
MBW04	13/08/2024	2:15:00 PM	13,050	7.50	48.04	-	-	<1	<1	1,530	1530	-	288	3,590	44	131	2,610
MBW04	12/11/2024	11:45:00 AM	13,020	7.40	48.01	-	-	-	-	-	-	-	-	-	-	-	-
MBW6A	1/02/2024	11:50:00 AM	1,892	6.20	Top RL not provided	-	-	-	-	-	-	-	-	-	-	-	-
MBW6A	21/05/2024	10:20:00 AM	1,720	6.20	Top RL not provided	-	-	-	-	-	-	-	-	-	-	-	-
MBW6A	14/08/2024	9:30:00 AM	1,853	6.30	Top RL not provided	-	-	<1	<1	108	108	-	43	495	34	38	275
MBW6A	12/11/2024	10:30:00 AM	1,989	6.20	Top RL not provided	21.1	-	-	-	-	-	-	-	-	-	-	-
MTD605P	7/02/2024	11:50:00 AM	16,980	7.20	62.7	22.7	-	-	-	-	-	-	-	-	-	-	-
MTD605P	21/05/2024	9:10:00 AM	17,220	7.20	62.6	20.1	-	-	-	-	-	-	-	-	-	-	-
MTD605P	14/08/2024	11:30:00 AM	17,240	7.40	62.65	19.7	-	<1	<1	2,040	2040	-	968	4,180	54	27	4,270
MTD605P	12/11/2024	9:35:00 AM	17,700	7.20	62.73	22.9	-	-	-	-	-	-	-	-	-	-	-
MTD614P	20/03/2024	10:35:00 AM	6,870	7.20	56.02	18.9	-	-	-	-	-	-	-	-	-	-	-
MTD614P	20/06/2024	9:40:00 AM	6,460	7.30	56.04	18.9	-	<1	<1	1,680	1680	----	125	1,130	70	175	1,440
MTD614P	19/09/2024	12:50:00 PM	6,600	7.20	56.22	18.7	-	-	-	-	-	-	-	-	-	-	-
MTD614P	10/12/2024	7:20:00 AM	6,540	7.20	56.03	16.8	-	-	-	-	-	-	-	-	-	-	-
OH1121	19/03/2024	1:00:00 PM	8,700	7.00	36.41	-	-	-	-	-	-	-	-	-	-	-	-
OH1121	19/06/2024	12:30:00 PM	8,270	7.00	36.09	-	-	<1	<1	673	673	-	230	2,510	191	176	1,580
OH1121	18/09/2024	10:50:00 AM	8,530	7.20	35.98	-	-	-	-	-	-	-	-	-	-	-	-
OH1121	9/12/2024	11:45:00 AM	9,000	7.00	35.89	-	-	-	-	-	-	-	-	-	-	-	-
OH1122 (1)	20/03/2024	11:10:00 AM	-	-	dry	-	-	-	-	-	-	-	-	-	-	-	-
OH1122 (1)	14/06/2024	10:45:00 AM	-	-	dry	21.1	-	-	-	-	-	-	-	-	-	-	-

Table E 1 Annual groundwater quality laboratory results - 2024 Continued

Sample Point	Date	Time	K - Total (mg/l)	Al - Total (mg/l)	As - Total (mg/l)	Cd - Total (mg/l)	Cu - Total (mg/l)	Pb - Total (mg/l)	Ni - Total (mg/l)	Se (mg/l)	Zn - Total (mg/l)	B (mg/l)	Hg - Total (mg/l)	Mo (mg/l)	V (mg/l)	Cr (mg/l)	Total anions	Total Cations	Ionic Balance
MB15MTW06	15/08/2024	10:10:00 AM	2	1.6	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.05	<0.0001	-	-	-	0.98	0.95	----
MB15MTW06	21/11/2024	9:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW07	1/02/2024	10:05:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW07	20/05/2024	9:55:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW07	13/08/2024	11:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW07	18/11/2024	1:15:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW08	1/02/2024	9:45:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW08	20/05/2024	9:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW08	13/08/2024	11:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW08	18/11/2024	1:05:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW09	1/02/2024	9:35:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW09	21/05/2024	1:20:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW09	13/08/2024	10:35:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW09	18/11/2024	1:00:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW10	1/02/2024	9:55:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW10	20/05/2024	9:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW10	13/08/2024	11:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW10	18/11/2024	1:20:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW11	1/02/2024	9:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW11	28/05/2024	9:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW11	13/08/2024	10:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MB15MTW11	21/11/2024	10:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW01	7/02/2024	1:10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW01	20/05/2024	12:45:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW01	15/08/2024	11:20:00 AM	19	0.44	0.001	<0.0001	0.001	<0.001	0.003	<0.01	0.009	<0.05	<0.0001	-	-	-	98.6	94.5	2.12
MBW01	21/11/2024	12:50:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW02	1/02/2024	12:35:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW02	20/05/2024	12:10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW02	13/08/2024	1:30:00 PM	16	<0.01	0.013	<0.0001	<0.001	<0.001	0.003	<0.01	<0.005	0.17	<0.0001	-	-	-	96.8	102	2.6
MBW02	12/11/2024	11:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW03	1/02/2024	12:30:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW03	20/05/2024	12:20:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW03	13/08/2024	2:00:00 PM	16	3.45	0.001	<0.0001	<0.001	0.011	0.004	<0.01	0.023	0.17	<0.0001	-	-	-	93.2	95.1	1.01
MBW03	12/11/2024	11:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW04	1/02/2024	1:00:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW04	20/05/2024	12:30:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW04	13/08/2024	2:15:00 PM	20	0.19	<0.001	<0.0001	<0.001	<0.001	0.001	<0.01	<0.005	0.12	<0.0001	-	-	-	138	127	4.08
MBW04	12/11/2024	11:45:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW6A	1/02/2024	11:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW6A	21/05/2024	10:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBW6A	14/08/2024	9:30:00 AM	4	5.31	0.001	<0.0001	0.008	0.006	0.012	<0.01	0.147	0.08	<0.0001	-	-	-	17	16.9	0.38
MBW6A	12/11/2024	10:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MTD605P	7/02/2024	11:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MTD605P	21/05/2024	9:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MTD605P	14/08/2024	11:30:00 AM	12	0.04	<0.001	<0.0001	<0.001	<0.001	0.005	<0.01	<0.005	0.3	<0.0001	-	-	-	179	191	3.28
MTD605P	12/11/2024	9:35:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MTD614P	20/03/2024	10:35:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MTD614P	20/06/2024	9:40:00 AM	13	0.04	0.002	<0.0001	0.001	<0.001	0.002	<0.01	<0.005	0.11	<0.0001	----	----	----	68	80.9	8.61
MTD614P	19/09/2024	12:50:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MTD614P	10/12/2024	7:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1121	19/03/2024	1:00:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1121	19/06/2024	12:30:00 PM	14	0.06	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.005	0.09	<0.0001	----	----	----	89	93.1	2.23
OH1121	18/09/2024	10:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1121	9/12/2024	11:45:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1122 (1)	20/03/2024	11:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1122 (1)	14/06/2024	10:45:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table E 1 Annual groundwater quality laboratory results - 2024 Continued

Sample Point	Date	Time	EC Field (uS/cm (25TRef))	pH Field	RL Standing Water Level (m)	Water Temp (Deg C)	TDS - Total (mg/l)	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Acidity as CaCO3	SO4 - Total (mg/l)	Cl- (mg/l)	Ca - Total (mg/l)	Mg - Total (mg/l)	Na - Total (mg/l)
OH1122 (1)	19/09/2024	1:15:00 PM	-	-	dry	21.5	-	-	-	-	-	-	-	-	-	-	-
OH1122 (1)	5/12/2024	11:40:00 AM	-	-	dry	21.1	-	-	-	-	-	-	-	-	-	-	-
OH1125 (1)	19/03/2024	8:30:00 AM	13,670	6.70	49.5	21.1	-	-	-	-	-	-	-	-	-	-	-
OH1125 (1)	20/06/2024	10:40:00 AM	13,960	6.70	50.5	-	-	<1	<1	956	956	113	778	4,460	381	615	2,240
OH1125 (1)	18/09/2024	9:20:00 AM	13,390	6.70	51.13	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (1)	10/12/2024	9:30:00 AM	13,980	6.70	50.83	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	17/01/2024	10:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	20/02/2024	10:15:00 AM	-	-	dry	21.2	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	14/03/2024	12:40:00 PM	-	-	dry	18.8	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	10/04/2024	10:50:00 AM	-	-	dry	19.7	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	16/05/2024	8:45:00 AM	-	-	dry	23.7	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	20/06/2024	10:30:00 AM	-	-	dry	20.7	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	22/07/2024	12:50:00 PM	-	-	dry	20.3	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	22/08/2024	9:55:00 AM	-	-	dry	21.9	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	12/09/2024	11:15:00 AM	-	-	dry	20.7	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	8/10/2024	8:50:00 AM	-	-	dry	19.1	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	7/11/2024	9:15:00 AM	-	-	dry	19.3	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	10/12/2024	9:20:00 AM	-	-	dry	18.9	-	-	-	-	-	-	-	-	-	-	-
OH1126	19/03/2024	9:30:00 AM	7,210	6.60	50.22	19.5	-	-	-	-	-	-	-	-	-	-	-
OH1126	20/06/2024	11:50:00 AM	8,380	6.60	49.69	20.1	-	<1	<1	616	616	98	593	2,320	78	204	1,640
OH1126	18/09/2024	10:05:00 AM	7,780	6.70	49.5	19.8	-	-	-	-	-	-	-	-	-	-	-
OH1126	18/12/2024	11:10:00 AM	7,660	6.80	49.05	21.6	-	-	-	-	-	-	-	-	-	-	-
OH1127	19/03/2024	12:45:00 PM	-	-	-	21.2	-	-	-	-	-	-	-	-	-	-	-
OH1127	19/06/2024	12:15:00 PM	-	-	-	21.3	-	-	-	-	-	-	-	-	-	-	-
OH1127	18/09/2024	10:40:00 AM	-	-	-	20.9	-	-	-	-	-	-	-	-	-	-	-
OH1127	9/12/2024	11:35:00 AM	-	-	-	22.5	-	-	-	-	-	-	-	-	-	-	-
OH1137	19/03/2024	9:00:00 AM	13,400	7.10	Top RL not provided	19.7	-	-	-	-	-	-	-	-	-	-	-
OH1137	20/06/2024	11:20:00 AM	14,070	7.20	Top RL not provided	19.2	-	<1	<1	1,130	1130	----	680	4,130	112	322	2,890
OH1137	18/09/2024	9:45:00 AM	13,980	7.10	Top RL not provided	19.9	-	-	-	-	-	-	-	-	-	-	-
OH1137	10/12/2024	10:10:00 AM	14,270	7.30	Top RL not provided	19.3	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	17/01/2024	11:50:00 AM	19,130	6.20	61.97	19.1	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	20/02/2024	9:50:00 AM	19,450	6.00	61.81	20	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	14/03/2024	1:25:00 PM	18,920	6.10	61.88	19.5	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	10/04/2024	10:25:00 AM	20,000	6.10	61.76	21.5	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	16/05/2024	9:15:00 AM	19,690	6.20	61.66	21.3	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	20/06/2024	1:20:00 PM	19,860	6.10	61.79	21.3	-	<1	<1	246	246	----	459	6,770	163	844	3,070
OH1138 (1)	22/07/2024	12:30:00 PM	19,390	6.20	61.67	18.3	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	22/08/2024	10:10:00 AM	18,700	6.10	61.76	19.2	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	12/09/2024	11:25:00 AM	18,770	6.10	61.76	20.8	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	8/10/2024	9:00:00 AM	19,130	6.10	61.69	20.7	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	7/11/2024	8:55:00 AM	19,280	6.10	61.76	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	10/12/2024	9:50:00 AM	19,490	6.10	61.67	19.7	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	17/01/2024	11:30:00 AM	12,580	6.60	58.9	22.3	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	20/02/2024	9:10:00 AM	12,430	6.50	57.56	21.1	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	14/03/2024	12:55:00 PM	12,410	6.60	57.57	19.3	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	10/04/2024	10:00:00 AM	12,760	6.60	57.45	20.9	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	16/05/2024	9:00:00 AM	12,540	6.60	57.37	20.2	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	20/06/2024	1:00:00 PM	12,400	6.60	57.35	21.5	-	<1	<1	734	734	----	590	4,020	564	480	1,780
OH1138 (2)	22/07/2024	12:40:00 PM	12,020	6.60	57.24	19	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	22/08/2024	10:00:00 AM	11,750	6.60	57.22	19	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	12/09/2024	11:30:00 AM	12,050	6.60	57.23	21.5	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	8/10/2024	9:10:00 AM	12,350	6.60	57.16	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	7/11/2024	9:05:00 AM	12,130	6.60	57.17	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	10/12/2024	10:00:00 AM	12,590	6.60	57.12	-	-	-	-	-	-	-	-	-	-	-	-
OH786	26/03/2024	11:55:00 AM	449	7.20	49.39	-	-	-	-	-	-	-	-	-	-	-	-
OH786	19/06/2024	1:10:00 PM	572	7.40	55.28	-	-	<1	<1	150	150	-	20	75	25	14	67

Table E 1 Annual groundwater quality laboratory results - 2024 Continued

Sample Point	Date	Time	K - Total (mg/l)	Al - Total (mg/l)	As - Total (mg/l)	Cd - Total (mg/l)	Cu - Total (mg/l)	Pb - Total (mg/l)	Ni - Total (mg/l)	Se (mg/l)	Zn - Total (mg/l)	B (mg/l)	Hg - Total (mg/l)	Mo (mg/l)	V (mg/l)	Cr (mg/l)	Total anions	Total Cations	Ionic Balance
OH1122 (1)	19/09/2024	1:15:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1122 (1)	5/12/2024	11:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (1)	19/03/2024	8:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (1)	20/06/2024	10:40:00 AM	26	0.08	<0.001	0.0001	0.005	<0.001	0.003	<0.01	0.013	0.08	<0.0001	<0.001	<0.01	<0.001	161	168	2.01
OH1125 (1)	18/09/2024	9:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (1)	10/12/2024	9:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	17/01/2024	10:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	20/02/2024	10:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	14/03/2024	12:40:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	10/04/2024	10:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	16/05/2024	8:45:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	20/06/2024	10:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	22/07/2024	12:50:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	22/08/2024	9:55:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	12/09/2024	11:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	8/10/2024	8:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	7/11/2024	9:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1125 (3)	10/12/2024	9:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1126	19/03/2024	9:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1126	20/06/2024	11:50:00 AM	21	33.5	0.008	0.0004	0.127	0.053	0.056	0.02	0.235	0.09	<0.0001	----	----	----	90.1	92.6	1.34
OH1126	18/09/2024	10:05:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1126	18/12/2024	11:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1127	19/03/2024	12:45:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1127	19/06/2024	12:15:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1127	18/09/2024	10:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1127	9/12/2024	11:35:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1137	19/03/2024	9:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1137	20/06/2024	11:20:00 AM	31	0.65	<0.001	<0.0001	0.011	0.002	0.006	<0.01	0.025	<0.05	0.0002	----	----	----	153	158	1.72
OH1137	18/09/2024	9:45:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1137	10/12/2024	10:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	17/01/2024	11:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	20/02/2024	9:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	14/03/2024	1:25:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	10/04/2024	10:25:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	16/05/2024	9:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	20/06/2024	1:20:00 PM	68	0.69	<0.001	0.001	0.002	<0.001	0.017	<0.01	0.022	<0.05	0.0005	----	----	----	205	213	1.78
OH1138 (1)	22/07/2024	12:30:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	22/08/2024	10:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	12/09/2024	11:25:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	8/10/2024	9:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	7/11/2024	8:55:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (1)	10/12/2024	9:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	17/01/2024	11:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	20/02/2024	9:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	14/03/2024	12:55:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	10/04/2024	10:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	16/05/2024	9:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	20/06/2024	1:00:00 PM	23	0.02	0.002	<0.0001	<0.001	<0.001	0.002	<0.01	<0.005	<0.05	<0.0001	----	----	----	140	146	1.86
OH1138 (2)	22/07/2024	12:40:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	22/08/2024	10:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	12/09/2024	11:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	8/10/2024	9:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	7/11/2024	9:05:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH1138 (2)	10/12/2024	10:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH786	26/03/2024	11:55:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH786	19/06/2024	1:10:00 PM	5	1.08	<0.001	0.0002	0.017	0.005	0.007	<0.01	0.358	<0.05	<0.0001	----	----	----	5.53	5.44	0.79

Table E 1 Annual groundwater quality laboratory results - 2024 Continued

Sample Point	Date	Time	EC Field (uS/cm (25TRef))	pH Field	RL Standing Water Level (m)	Water Temp (Deg C)	TDS - Total (mg/l)	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Acidity as CaCO3	SO4 - Total (mg/l)	Cl- (mg/l)	Ca - Total (mg/l)	Mg - Total (mg/l)	Na - Total (mg/l)
OH786	18/09/2024	8:05:00 AM	689	7.20	53.92	-	-	-	-	-	-	-	-	-	-	-	-
OH786	10/12/2024	11:40:00 AM	873	7.20	50.53	-	-	-	-	-	-	-	-	-	-	-	-
OH787	26/03/2024	12:15:00 PM	19,400	7.30	37.93	-	-	-	-	-	-	-	-	-	-	-	-
OH787	26/06/2024	10:35:00 AM	-	-	-	22.4	-	-	-	-	-	-	-	-	-	-	-
OH787	19/09/2024	8:20:00 AM	16,450	7.50	36.88	19.8	-	<1	<1	1,190	1190	8	328	5,700	119	268	3,630
OH787	10/12/2024	12:00:00 PM	17,970	7.50	36.85	19.6	-	-	-	-	-	-	-	-	-	-	-
OH788	26/03/2024	10:50:00 AM	12,840	7.00	36.67	20.6	-	-	-	-	-	-	-	-	-	-	-
OH788	26/06/2024	10:45:00 AM	10,570	7.10	36.61	21.7	-	<1	<1	1,110	1110	-	394	2,840	98	260	2,090
OH788	19/09/2024	1:00:00 PM	10,530	7.10	36.52	20.1	-	-	-	-	-	-	-	-	-	-	-
OH788	9/12/2024	10:15:00 AM	11,190	7.00	37.38	19.5	-	-	-	-	-	-	-	-	-	-	-
OH942	26/03/2024	11:45:00 AM	24,300	6.70	46.63	19.7	-	-	-	-	-	-	-	-	-	-	-
OH942	19/06/2024	2:00:00 PM	23,300	6.80	46.55	20.3	-	<1	<1	726	726	-	961	7,760	214	759	4,730
OH942	19/09/2024	7:50:00 AM	22,500	6.80	46.95	16.4	-	-	-	-	-	-	-	-	-	-	-
OH942	10/12/2024	11:30:00 AM	23,700	6.70	47.9	22.2	-	-	-	-	-	-	-	-	-	-	-
OH943	18/03/2024	1:00:00 PM	-	-	dry	20.4	-	-	-	-	-	-	-	-	-	-	-
OH943	26/06/2024	10:50:00 AM	-	-	-	19.4	-	-	-	-	-	-	-	-	-	-	-
OH943	18/09/2024	12:55:00 PM	-	-	-	17.8	-	-	-	-	-	-	-	-	-	-	-
OH943	9/12/2024	10:20:00 AM	-	-	-	21.1	-	-	-	-	-	-	-	-	-	-	-
OH944	18/03/2024	1:35:00 PM	-	-	dry	19.8	-	-	-	-	-	-	-	-	-	-	-
OH944	14/06/2024	12:45:00 PM	-	-	dry	20.1	-	-	-	-	-	-	-	-	-	-	-
OH944	18/09/2024	2:05:00 PM	-	-	dry	16.9	-	-	-	-	-	-	-	-	-	-	-
OH944	9/12/2024	10:00:00 AM	-	-	dry	20.5	-	-	-	-	-	-	-	-	-	-	-
PZ7D	29/02/2024	12:30:00 PM	1,480	7.50	52.87	19.7	-	-	-	-	-	-	-	-	-	-	-
PZ7D	27/05/2024	10:50:00 AM	1,560	7.60	52.69	20.4	-	-	-	-	-	-	-	-	-	-	-
PZ7D	15/08/2024	9:10:00 AM	1,520	7.70	52.58	16.3	-	<1	<1	466	466	-	24	234	22	19	322
PZ7D	21/11/2024	8:30:00 AM	1,549	7.60	52.35	19	-	-	-	-	-	-	-	-	-	-	-
PZ7S	29/02/2024	12:10:00 PM	1,287	6.50	53.34	18.7	-	-	-	-	-	-	-	-	-	-	-
PZ7S	27/05/2024	10:20:00 AM	1,345	6.60	53.03	25.2	-	-	-	-	-	-	-	-	-	-	-
PZ7S	15/08/2024	8:30:00 AM	1,344	6.70	52.95	21.6	-	<1	<1	274	274	-	22	294	51	40	187
PZ7S	21/11/2024	8:00:00 AM	1,232	6.60	52.63	22.6	-	-	-	-	-	-	-	-	-	-	-
PZ8D	20/03/2024	9:00:00 AM	8,510	7.50	60.03	22	-	-	-	-	-	-	-	-	-	-	-
PZ8D	20/06/2024	8:20:00 AM	8,320	7.50	60.07	21.4	-	<1	<1	1,790	1790	----	35	1,940	35	38	2,000
PZ8D	19/09/2024	11:50:00 AM	8,510	7.50	60.06	20.3	-	-	-	-	-	-	-	-	-	-	-
PZ8D	9/12/2024	1:30:00 PM	8,500	7.40	59.6	20.6	-	-	-	-	-	-	-	-	-	-	-
PZ8S	20/03/2024	8:30:00 AM	13,700	6.80	60.65	19.9	-	-	-	-	-	-	-	-	-	-	-
PZ8S	20/06/2024	8:10:00 AM	13,500	6.80	60.71	21.4	-	<1	<1	647	647	----	532	4,310	126	297	2,710
PZ8S	19/09/2024	11:40:00 AM	13,250	6.80	60.67	21.2	-	<1	<1	628	628	----	518	4,690	125	289	2,700
PZ8S	9/12/2024	1:20:00 PM	13,630	6.70	60.57	21.5	-	-	-	-	-	-	-	-	-	-	-
PZ9D	20/03/2024	9:40:00 AM	10,160	7.00	48.97	23.5	-	-	-	-	-	-	-	-	-	-	-
PZ9D	20/06/2024	9:10:00 AM	9,400	7.10	49.12	22	-	<1	<1	985	985	----	433	2,380	205	279	1,670
PZ9D	19/09/2024	12:20:00 PM	9,390	7.10	48.9	21.2	-	-	-	-	-	-	-	-	-	-	-
PZ9D	10/12/2024	7:40:00 AM	9,880	7.00	48.94	21.4	-	-	-	-	-	-	-	-	-	-	-
PZ9S	20/03/2024	10:00:00 AM	11,080	7.00	59.84	20.1	-	-	-	-	-	-	-	-	-	-	-
PZ9S	20/06/2024	9:20:00 AM	3,200	7.20	59.87	20.5	-	<1	<1	281	281	----	158	758	49	89	506
PZ9S	19/09/2024	12:30:00 PM	4,580	7.20	59.93	20.3	-	<1	<1	383	383	----	220	1,220	70	144	771
PZ9S	10/12/2024	7:50:00 AM	10,390	7.00	59.9	20.7	-	-	-	-	-	-	-	-	-	-	-
WD625P	29/02/2024	9:30:00 AM	11,400	7.10	57.25	19.9	-	-	-	-	-	-	-	-	-	-	-
WD625P	27/05/2024	9:10:00 AM	11,780	7.20	57.15	21.1	-	-	-	-	-	-	-	-	-	-	-
WD625P	15/08/2024	2:20:00 PM	11,400	7.20	56.96	-	-	<1	<1	1,210	1210	-	257	3,660	117	213	2,420
WD625P	18/11/2024	10:40:00 AM	11,690	7.10	56.76	-	-	-	-	-	-	-	-	-	-	-	-
WOH2141A	1/02/2024	8:50:00 AM	10,020	7.60	45.99	19.5	-	-	-	-	-	-	-	-	-	-	-
WOH2141A	20/05/2024	8:45:00 AM	10,110	7.70	45.69	21.9	-	-	-	-	-	-	-	-	-	-	-
WOH2141A	13/08/2024	9:40:00 AM	9,970	7.70	45.32	18.8	-	<1	<1	1,230	1230	-	<10	2,720	39	21	2,170
WOH2141A	21/11/2024	9:45:00 AM	10,220	7.70	45.19	20	-	-	-	-	-	-	-	-	-	-	-
WOH2153A	29/02/2024	10:50:00 AM	2,790	7.80	47.25	21.2	-	-	-	-	-	-	-	-	-	-	-
WOH2153A	27/05/2024	9:50:00 AM	2,730	7.90	46.6	21	-	-	-	-	-	-	-	-	-	-	-

Table E 1 Annual groundwater quality laboratory results - 2024 Continued

Sample Point	Date	Time	K - Total (mg/l)	Al - Total (mg/l)	As - Total (mg/l)	Cd - Total (mg/l)	Cu - Total (mg/l)	Pb - Total (mg/l)	Ni - Total (mg/l)	Se (mg/l)	Zn - Total (mg/l)	B (mg/l)	Hg - Total (mg/l)	Mo (mg/l)	V (mg/l)	Cr (mg/l)	Total anions	Total Cations	Ionic Balance
OH786	18/09/2024	8:05:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH786	10/12/2024	11:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH787	26/03/2024	12:15:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH787	26/06/2024	10:35:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH787	19/09/2024	8:20:00 AM	28	0.12	0.001	<0.0001	<0.001	<0.001	0.005	<0.01	0.012	0.08	<0.0001	0.002	<0.01	0.001	191	187	1.27
OH787	10/12/2024	12:00:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH788	26/03/2024	10:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH788	26/06/2024	10:45:00 AM	38	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.005	0.08	<0.0001	----	----	----	110	118	3.36
OH788	19/09/2024	1:00:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH788	9/12/2024	10:15:00 AM	-	-	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.005	0.09	<0.0001	-	<0.01	<0.001	-	-	-
OH942	26/03/2024	11:45:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH942	19/06/2024	2:00:00 PM	45	0.14	0.001	<0.0001	0.001	0.001	0.006	<0.01	<0.005	0.05	0.0002	<0.001	<0.01	<0.001	253	280	4.99
OH942	19/09/2024	7:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH942	10/12/2024	11:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH943	18/03/2024	1:00:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH943	26/06/2024	10:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH943	18/09/2024	12:55:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH943	9/12/2024	10:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH944	18/03/2024	1:35:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH944	14/06/2024	12:45:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH944	18/09/2024	2:05:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OH944	9/12/2024	10:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ7D	29/02/2024	12:30:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ7D	27/05/2024	10:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ7D	15/08/2024	9:10:00 AM	6	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.005	0.11	<0.0001	-	-	-	16.4	16.8	1.23
PZ7D	21/11/2024	8:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ7S	29/02/2024	12:10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ7S	27/05/2024	10:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ7S	15/08/2024	8:30:00 AM	13	0.13	<0.001	<0.0001	<0.001	<0.001	0.01	<0.01	0.005	<0.05	<0.0001	-	-	-	14.2	14.3	0.27
PZ7S	21/11/2024	8:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ8D	20/03/2024	9:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ8D	20/06/2024	8:20:00 AM	12	0.06	0.005	0.0003	0.006	0.001	0.063	<0.01	0.156	0.19	<0.0001	----	----	----	91.2	92.2	0.52
PZ8D	19/09/2024	11:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ8D	9/12/2024	1:30:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ8S	20/03/2024	8:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ8S	20/06/2024	8:10:00 AM	12	1.71	0.002	0.0001	0.015	0.001	0.019	<0.01	0.007	<0.05	<0.0001	----	----	----	146	149	1.13
PZ8S	19/09/2024	11:40:00 AM	11	0.36	0.001	<0.0001	0.005	<0.001	0.002	<0.01	<0.005	<0.05	<0.0001	----	----	----	156	148	2.6
PZ8S	9/12/2024	1:20:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ9D	20/03/2024	9:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ9D	20/06/2024	9:10:00 AM	24	0.67	<0.001	0.0005	2.08	0.001	0.01	<0.01	0.022	0.07	<0.0001	----	----	----	95.8	106	5.25
PZ9D	19/09/2024	12:20:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ9D	10/12/2024	7:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ9S	20/03/2024	10:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PZ9S	20/06/2024	9:20:00 AM	21	14.8	0.003	0.001	0.056	0.006	0.012	<0.01	0.039	<0.05	<0.0001	----	----	----	30.3	32.3	3.24
PZ9S	19/09/2024	12:30:00 PM	25	7.72	0.002	<0.0001	0.11	0.004	0.012	<0.01	0.014	<0.05	<0.0001	----	----	----	46.6	49.5	2.99
PZ9S	10/12/2024	7:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WD625P	29/02/2024	9:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WD625P	27/05/2024	9:10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WD625P	15/08/2024	2:20:00 PM	16	0.02	<0.001	<0.0001	<0.001	<0.001	0.001	<0.01	0.008	0.16	<0.0001	-	-	-	133	129	1.42
WD625P	18/11/2024	10:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2141A	1/02/2024	8:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2141A	20/05/2024	8:45:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2141A	13/08/2024	9:40:00 AM	11	0.1	<0.001	<0.0001	<0.001	<0.001	0.002	<0.01	0.043	0.16	<0.0001	-	-	-	101	98.3	1.48
WOH2141A	21/11/2024	9:45:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2153A	29/02/2024	10:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2153A	27/05/2024	9:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table E 1 Annual groundwater quality laboratory results - 2024 Continued

Sample Point	Date	Time	EC Field (uS/cm (25TRef))	pH Field	RL Standing Water Level (m)	Water Temp (Deg C)	TDS - Total (mg/l)	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Acidity as CaCO3	SO4 - Total (mg/l)	Cl- (mg/l)	Ca - Total (mg/l)	Mg - Total (mg/l)	Na - Total (mg/l)
WOH2153A	15/08/2024	1:40:00 PM	2,810	7.90	47.05	19.2	-	<1	<1	1,090	1090	-	10	271	3	3	660
WOH2153A	18/11/2024	11:15:00 AM	2,810	7.90	46.13	20.1	-	-	-	-	-	-	-	-	-	-	-
WOH2153B	29/02/2024	11:00:00 AM	1,457	7.10	57.04	20.5	-	-	-	-	-	-	-	-	-	-	-
WOH2153B	28/05/2024	9:40:00 AM	1,543	7.20	56.17	22.2	-	-	-	-	-	-	-	-	-	-	-
WOH2153B	15/08/2024	1:50:00 PM	1,524	7.20	55.26	19.8	-	<1	<1	485	485	-	36	218	18	18	328
WOH2153B	18/11/2024	11:30:00 AM	1,584	7.10	56.77	21	-	-	-	-	-	-	-	-	-	-	-
WOH2154A	29/02/2024	10:00:00 AM	4,770	7.40	43.39	21.5	-	-	-	-	-	-	-	-	-	-	-
WOH2154A	27/05/2024	9:25:00 AM	-	-	-	21.7	-	-	-	-	-	-	-	-	-	-	-
WOH2154A	15/08/2024	2:10:00 PM	-	-	-	19.9	-	-	-	-	-	-	-	-	-	-	-
WOH2154A	18/11/2024	9:20:00 AM	4,490	7.50	42.75	19.9	-	<1	<1	979	979	-	131	973	8	5	1,020
WOH2154B	29/02/2024	10:20:00 AM	8,600	7.20	56.65	20.8	-	-	-	-	-	-	-	-	-	-	-
WOH2154B	27/05/2024	9:25:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2154B	15/08/2024	2:10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2154B	18/11/2024	9:30:00 AM	7,710	7.30	56.84	-	-	<1	<1	951	951	-	222	2,360	93	140	1,480
WOH2155A	29/02/2024	8:40:00 AM	7,270	7.00	38.28	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155A	27/05/2024	9:00:00 AM	7,450	7.10	38.83	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155A	15/08/2024	12:30:00 PM	7,080	7.10	39.05	-	-	<1	<1	817	817	-	608	1,590	29	55	1,630
WOH2155A	18/11/2024	12:10:00 PM	7,210	7.10	36.99	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155B	29/02/2024	8:50:00 AM	7,370	7.10	58.01	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155B	28/05/2024	10:35:00 AM	7,890	7.10	57.78	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155B	15/08/2024	12:45:00 PM	7,590	7.20	57.76	-	-	<1	<1	723	723	-	450	1,940	108	86	1,590
WOH2155B	18/11/2024	12:20:00 PM	6,940	7.20	57.68	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156A	15/02/2024	12:50:00 PM	14,480	7.10	35.33	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156A	28/05/2024	12:20:00 PM	13,800	7.00	35.64	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156A	15/08/2024	11:50:00 AM	13,960	7.00	34.92	-	-	<1	<1	1,210	1210	-	1,020	4,290	143	232	3,020
WOH2156A	18/11/2024	8:40:00 AM	14,280	7.00	34.24	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156B	15/02/2024	1:10:00 PM	12,730	6.80	49.31	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156B	28/05/2024	11:30:00 AM	12,170	6.70	62.72	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156B	15/08/2024	12:00:00 PM	12,320	6.80	66	-	-	<1	<1	790	790	-	881	3,810	164	204	2,690
WOH2156B	18/11/2024	8:50:00 AM	12,620	6.70	58.96	-	-	-	-	-	-	-	-	-	-	-	-

Table E 1 Annual groundwater quality laboratory results - 2024 Continued

Sample Point	Date	Time	K - Total (mg/l)	Al - Total (mg/l)	As - Total (mg/l)	Cd - Total (mg/l)	Cu - Total (mg/l)	Pb - Total (mg/l)	Ni - Total (mg/l)	Se (mg/l)	Zn - Total (mg/l)	B (mg/l)	Hg - Total (mg/l)	Mo (mg/l)	V (mg/l)	Cr (mg/l)	Total anions	Total Cations	Ionic Balance
WOH2153A	15/08/2024	1:40:00 PM	6	0.35	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	0.074	0.16	<0.0001	-	-	-	29.6	29.2	0.63
WOH2153A	18/11/2024	11:15:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2153B	29/02/2024	11:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2153B	28/05/2024	9:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2153B	15/08/2024	1:50:00 PM	7	6.9	<0.001	0.0001	0.004	0.007	0.003	<0.01	0.075	0.1	<0.0001	-	-	-	16.6	16.8	0.71
WOH2153B	18/11/2024	11:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2154A	29/02/2024	10:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2154A	27/05/2024	9:25:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2154A	15/08/2024	2:10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2154A	18/11/2024	9:20:00 AM	6	0.36	<0.001	0.0002	0.032	<0.001	0.004	<0.01	0.139	0.13	<0.0001	-	-	-	49.7	45.3	4.63
WOH2154B	29/02/2024	10:20:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2154B	27/05/2024	9:25:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2154B	15/08/2024	2:10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2154B	18/11/2024	9:30:00 AM	16	11.4	0.003	0.0003	0.011	0.009	0.011	<0.01	0.194	0.12	<0.0001	-	-	-	90.2	80.9	5.4
WOH2155A	29/02/2024	8:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155A	27/05/2024	9:00:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155A	15/08/2024	12:30:00 PM	14	0.12	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.005	0.09	<0.0001	-	-	-	73.8	77.2	2.25
WOH2155A	18/11/2024	12:10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155B	29/02/2024	8:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155B	28/05/2024	10:35:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2155B	15/08/2024	12:45:00 PM	14	17.5	0.002	<0.0001	0.006	0.036	0.004	<0.01	0.033	0.2	<0.0001	-	-	-	78.5	82	2.15
WOH2155B	18/11/2024	12:20:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156A	15/02/2024	12:50:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156A	28/05/2024	12:20:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156A	15/08/2024	11:50:00 AM	24	0.16	0.001	<0.0001	<0.001	<0.001	0.002	<0.01	0.063	0.14	<0.0001	-	-	-	166	158	2.53
WOH2156A	18/11/2024	8:40:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156B	15/02/2024	1:10:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156B	28/05/2024	11:30:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WOH2156B	15/08/2024	12:00:00 PM	25	0.29	<0.001	<0.0001	<0.001	<0.001	0.006	<0.01	0.034	0.17	<0.0001	-	-	-	142	143	0.36
WOH2156B	18/11/2024	8:50:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix 7:

Annual Rehabilitation Report



Annual Rehabilitation Report - 2024

Mount Thorley Warkworth

DOCUMENT CONTROL

Version	Date	Revision Description	Author	Approver
1.0	31/03/2025	ARR document prepared to satisfy Standard Conditions on Mining Leases	Bill Baxter Environmental Specialist - Rehabilitation	Gary Mulhearn Environment & Community Manager
2.0	26/05/2025	Updated to match Portal KPI Reports	Bill Baxter Environmental Specialist - Rehabilitation	Gary Mulhearn Environment & Community Manager

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DEFINITIONS / ABBREVIATIONS

BBAM - BioBanking Assessment Method
BCD – Biodiversity and Conservation Division
CCC – Community consultative Committee
CCL – Consolidated Coal Lease
CL – Coal Lease
DCCEEW (Federal) – Department of Climate Change, Energy, the Environment and Water (Australian Government)
DPE – NSW Department of Planning and Environment
EIS – Environmental Impact Statement
EL – Exploration Licence
EPBC - Environment Protection and Biodiversity Conservation Act
EPA – NSW Environment and Protection Authority
EPL – Environment Protection Licence
FLRP – Final Landform and Rehabilitation Plan
HTE – High Threat Exotics
ITP – Inspection Test Plan
LEM – Landform Evolution Model
ML – Mining Lease
MTO - Mount Thorley Operations
MTW - Mount Thorley Warkworth Coal Mine (combined operations)
RML - Radiation Management Licence
RMP – Rehabilitation Management Plan
ROBJ – Rehabilitation Objectives
RR – NSW Resources Regulator
TSF – Tailings Storage Facility
VENM - Virgin Excavated Natural Material
WML - Warkworth Mining Limited

Name of mine:	Mount Thorley Warkworth	
Annual Rehabilitation Report Period:	**START DATE:**	**END DATE:**
	1 January 2024	31 December 2024
Annual Rehabilitation Report revision dates and version numbers:	Version 2.0 - 26 May 2025	
Mining leases	**No**	**Expiry**
	CL 219	23 September 2044
	ML 1752	17 March 2038
	CCL 753	17 February 2034
	ML 1412	11 January 2038
	ML 1590	26 February 2028
	ML 1751	17 March 2038
	ML 1828	25 February 2043
Name of Lease holder(s)	Mount Thorley Operations Pty Ltd Warkworth Mining Limited Mount Thorley Coal Loading Ltd	
Date of Submission	21 MAY 2025	

1.0 MINING DETAILS

1.1 PROJECT DESCRIPTION

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

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

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

1.2 CURRENT DEVELOPMENT CONSENTS, LEASES, AND LICENCES

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

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

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

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

Radiation Management License: RML 5061110, RML 5061122.

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

Store Explosives License: XSTR100160.

In 2024, a change to EPL 1976 (Mount Thorley) was approved to: 1) amend the EPL premises boundary back to the common mining lease boundary between MTO and Bulga Coal after completion of cross mining lease dumping into a small area of Bulga Coal mining lease; and 2) relocate one Dustrak PM10 air quality monitor from Bulga Mine land to MTO, so that Bulga Coal could continue their planned overburden dumping operations where the monitor was located.

1.3 LAND OWNERSHIP AND LAND USE

Listed below are the ownership/subdivision changes for land related to MTW that occurred during the reporting period.

Southern Biodiversity Area - no ownership change. New lots created as a result of subdivision.

- 1-2//1294001 Coal & Allied Operations Pty Limited. These lots are made up of part 1//129806, 2//129806, 118//755267, 119//755267, 128//755267, 135//755267, 142//755267, 1//48592, 1//129808, 4//783484, 5//783484, 108//755267, 122//755267, 143//755267, 145//755267, 195//755267
- 3//1294001 Coal & Allied Operations Pty Limited (part formerly 3-4//783484 - Coal & Allied Operations Pty Limited; part formerly 1//592598 - Coal & Allied Operations Pty Limited 51%)
- 4//1294001 Coal & Allied Operations Pty Limited 51% (part formerly 1//592598 - Coal & Allied Operations Pty Limited 51%; parts formerly in Auto Consol 6747-86, Auto Consol 2653-177, 1//48592, 3//783484 & 4//783484 - Coal & Allied Operations Pty Limited)

Acquisition (Property K in MTO Development Consent SSD-6465 - landowner triggered acquisition upon request):

- 5//10022 – Mount Thorley Operations Pty Limited

2.0 COMPLAINTS

No complaints related to rehabilitation received in 2024.

3.0 STAKEHOLDER CONSULTATION

Table 1: Stakeholder Consultation 2024

Date	Stakeholder	Consultation Forms	Matters	Actions
February 2024	Community Consultative Committee (CCC)	CCC Meeting Document Circulated	Rehabilitation and disturbance forecasts for 2024 and YTD progress Updated RMP, with approved ROBJ and FLRP included, circulated to CCC for consultation.	MTW provided information on the change in dump heights between the current consent and the previous approval.
May 2024	Community Consultative Committee	CCC Meeting	YTD progress against rehabilitation and disturbance targets for 2024.	No actions required
May 2024	DDCCEEW (Federal)	Document Circulated	Updated RMP, with approved ROBJ and FLRP	No actions required

Date	Stakeholder	Consultation Forms	Matters	Actions
			included, circulated for consultation and approval.	
August 2024	Community Consultative Committee	CCC Meeting	YTD progress against rehabilitation and disturbance targets for 2024.	No actions required
November 2024	Community Consultative Committee	CCC Meeting	YTD progress against rehabilitation and disturbance targets for 2024.	No actions required

4.0 SURFACE DISTURBANCE AND REHABILITATION ACTIVITIES

Surface disturbance activities included:

- Progression of mining in North Pit and West Pit areas, including associated water management infrastructure (64.9ha)
- Disturbance in Mount Thorley to allow construction of warehouse storage igloo (0.3ha)
- Rehabilitation disturbance at Mount Thorley Coal Loader to extend laydown area for pump maintenance (0.2ha)

The disturbance in this reporting period was 65.4ha. This is less than the 78.7ha of disturbance that was forecast in the Forward Program due to disturbance ahead of mining in West Pit and North Pit being delayed.

Rehabilitation activities included:

- Rehabilitation of overburden emplacements in Mount Thorley (38.4ha), Centre Dump (CD) (24.4ha), and South Pit (16.0ha).
- Rehabilitation of Tailings Dam 1 (13.7ha)
- Sowing of area to target land use seed mixes in Mount Thorley (2.8ha). Area reported in Growth Medium Development phase since 2018.
- Reclassification of access tracks within rehabilitation areas in Mount Thorley (5.3ha).

The rehabilitation (Ecosystem and Land Use Establishment) undertaken in this reporting period was 100.6ha.

The 2014 Environmental Impact Statements for the Warkworth Continuation Project and the Mt Thorley Continuation Project modelled MTW's conceptual progress with mining and rehabilitation in indicative mine plans at different stages over the course of MTW executing it's operations. These documents modelled a total of 1,607.8 ha of rehabilitation completion by the end of 2023. At the end of the 2024

reporting period there had been 1,470.0 hectares of rehabilitation completed across Warkworth and Mount Thorley, which is 137.8ha less than predicted in the indicative EIS forecast for the end of 2023.

Rehabilitation Planning Activities

The MTW Final Landform and Rehabilitation Plan (FLRP) was submitted to the Resources Regulator (RR) in August 2023, and was approved by RR on 8 December 2023 (FLRP0001145). The final landform of MTW has been designed using a geomorphological landform design approach based on alluvial analogues. The landform design work was undertaken using an external specialist consultant (WSP Australia) and an erosional risk analysis has been conducted to determine areas that require rock lining for erosion protection.

The landform design work included the sizing and positioning of a temporary stockpile of capping material for the Loders Pit Tailings Storage Facility (TSF). The Loders Pit TSF will be used for tailings deposition through to the closure of MTW. Sufficient material will be needed to be stockpiled adjacent to this facility during the operational phase of the mine to facilitate capping at closure. Further studies have been undertaken to reduce the amount of capping material required to be stockpiled. A plan showing the interim landform with the temporary capping stockpile will be presented in a future update to the MTW RMP.

Drainage designs have been developed to facilitate staged offsite release of stabilised rehabilitation catchments from the southwest corner of Mount Thorley. Water release from rehabilitation catchments will be contingent upon MTW demonstrating that the water quality of runoff from rehabilitation areas is consistent with the natural watercourses that the rehabilitation catchments will report to.

A monitoring network has been designed to collect water quality information for runoff from rehabilitation catchments. Water quality monitoring points in rehabilitation areas have been in operation for a limited number of sites since 2021. The upgraded monitoring network will provide information across most of the areas of existing rehabilitation. Funds have been included in the 2025 capital budget to cover installation of the upgraded monitoring network.

Surface soils from 12.7ha of stripping area ahead of mining in North Pit were assessed and classified in accordance with the NSW EPA requirements for classifying excavated materials as Virgin Excavated Natural Material (VENM). The stripped soil is proposed for off-site re-use in revegetation activities at MTW's Northern Biodiversity Area.

Subsidence Repair Undertaken

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

Rehabilitation Management and Maintenance Activities

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

- Weed wiping of *Acacia saligna* shrubs and various exotic grasses (22.5ha);
- Manual removal (mulching and pulling out using tractor bucket) of *Acacia saligna* shrubs (82.0ha)
- Selective spraying (backpack) of various exotic grasses and broadleaf weeds (166.4ha); and

- Manual removal (Cut and Paint) of *Acacia saligna* shrubs (110.0ha)

Some rehabilitation areas susceptible to surface ponding which resulted in poor germination results (0.8ha) were re-aerated and re-seeded with native seed mixes designed for wet areas.

Two 1080 ground baiting programmes utilising meat baits were undertaken during autumn and spring to target wild dogs and foxes. The program consisted of approximately 55 bait sites across MTW, including rehabilitation areas.

A feral pig trapping and baiting programme was carried out across MTW in winter that resulted in 83 feral pigs being controlled.

Rehabilitation Actions

Design of temporary capping material stockpile for Loders Pit TSF was undertaken following investigations to reduce the amount of capping material required for the closure of the Loders Pit TSF. Recommendation from Targeted Assessment Program – Landform Establishment (May 2021).

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

SIBERIA modelling was undertaken by an external consultancy to investigate long term stability of the highwall in West Pit/North Pit and Loders Pit. Spoil samples for weathered materials at MTW were used for testing to determine weathering parameters. This information will be taken into account when determining the Landform Evolution Model (LEM) parameters that will be used to model landform stability in future work. Recommendation from Targeted Assessment Program – Landform Establishment (May 2021).

Draft Inspection Test Plans (ITP's) were developed which will form part of the Quality Assurance/Quality Control record system for rehabilitation activities at MTW. Recommendation from Targeted Assessment Program – Soils and Materials Management (June 2020); Landform Establishment (May 2021); and Revegetation (August 2024).

Introduction of ArcGIS and training of key staff in ArcGIS Pro to facilitate on site checking of topofactor values for as-built landforms. Recommendation from Targeted Assessment Program – Landform Establishment (May 2021).

Rehabilitation Areas That Have Achieved the Final Land Use

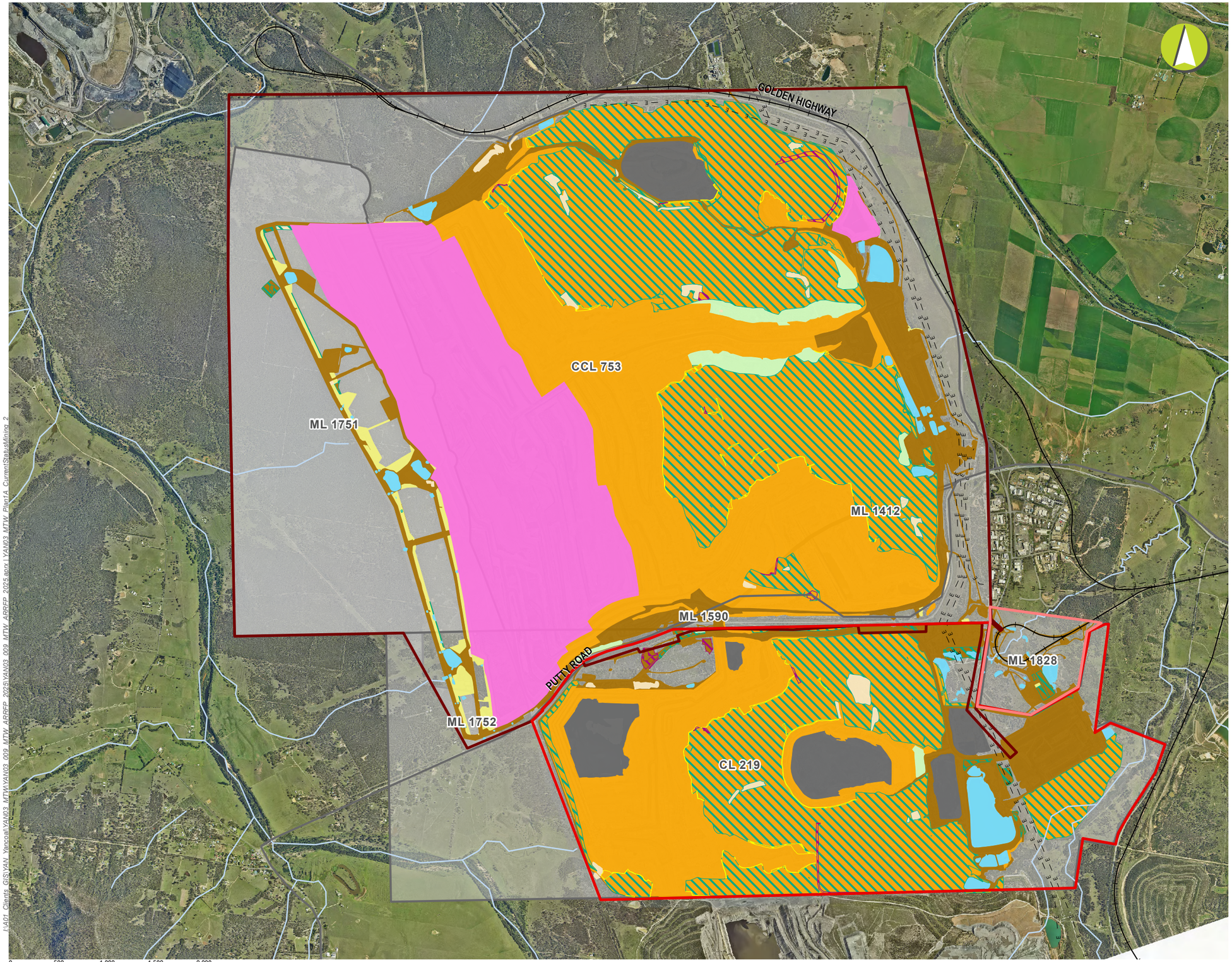
No areas achieved final land use during the 2024 reporting period.

Key Production Milestones

Table 2: Key Production Milestones Calendar Year 2024

Material	Unit	Year 1 2024 Forward Program	This report
Stripped topsoil	m3	79,230	65,400
Rock / Overburden	m3	107,690,777	111,344,762
Ore	Mt	16.73	17.24
Reject Material (Includes coarse rejects, tailings and any other wastes resulting from beneficiation)	Mt	5.37	5.41
Product	Mt	11.10	11.22

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



Scale: 1:40,000

LEGEND

Project Approval Number
- SSD 6464 - Warkworth
- SSD 6465 - Mount Thorley
- ML 1828 - Mount Thorley Coal Loader
- Railway
- Major Road
- Waterways
- Electricity Transmission Line

Current Authorisations
- Relevant Mining Title

Rehabilitation Phase
- Landform Establishment
- Growth Media Development
- Ecosystem and Land Use Establishment

Mining Domain Type
- Domain 1: Infrastructure Area
- Domain 2: Tailings Storage Facility
- Domain 3: Water Management Area
- Domain 4: Overburden Emplacement Area
- Domain 5: Active Mining Area (Open cut void)
- Domain 8a: Other - Topsoil Stockpile
- Domain 8b: Other - Topsoil Stripped
- Domain 8c: Other - Temporary Rehabilitation

Mount Thorley Warkworth Complex

Current Status Mining and Rehabilitation
PLAN 1A

Mine name	Mount Thorley Warkworth Complex
Plan name	Mount Thorley Warkworth ARR
Year of anticipated relinquishment	To be determined closer to closure
Data theme submission ID No.	TBD
Spatial Reference	GDA2020 MGA Zone 56
Plan date (date created)	24/03/2025

Sheet Size : A3

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MT THORLEY WARKWORTH

Source: Project Approval Boundary, rehabilitation, disturbance, watercourses and Current Authorisations from Yancoal (2024). Aerial imagery from Yancoal (2024).

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Figure 2: Plan 1B - Current Landform Contours



0 500 1,000 1,500 2,000 m

Scale: 1:40,000

Sheet Size : A3

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MT THORLEY WARKWORTH

LEGEND

Project Approval Number

- SSD 6464 - Warkworth
- SSD 6465 - Mount Thorley
- ML 1828 - Mount Thorley Coal Loader
- Current Landform Contours (5m)
- Railway
- Major Road
- Major Waterways
- Electricity Transmission Line

Current Authorisations

- Relevant Minerals Title

Source: Project Approval Boundary, rehabilitation, disturbance, watercourses and Current Authorisations from Yancoal (2024). Aerial imagery from Yancoal (2024).

Mount Thorley Warkworth Complex

Current Landform Contours
PLAN 1B

Mine name	Mount Thorley Warkworth Complex
Plan name	Mount Thorley Warkworth ARR
Year of anticipated relinquishment	To be determined closer to closure
Data theme submission ID No.	TBD
Spatial Reference	GDA2020 MGA Zone 56
Plan date (date created)	24/03/2025

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Disturbance and Rehabilitation Statistics

Table 3: Current Disturbance and Rehabilitation Progression Calendar Year 2024

	Annual Reporting Period	This report
A	Total disturbance footprint – surface disturbance	4,219.51
B	Total active disturbance (Ha)	2,722.15
C	Rehabilitation – land preparation (Ha)	27.37
D	Ecosystem and land use establishment (Ha)	1,470.00
E	Ecosystem and land use development (Ha)	0
F	Rehabilitation completion (Ha)	0

Table 4: Rehabilitation key Performance Indicators (KPI's) Calendar Year 2024

	Annual Reporting Period	This report
G	Total active disturbance during reporting period (Ha)	53.75
H	Area of land proposed for active rehabilitation during reporting period (Ha)	78.12
I	Established rehabilitation (Ha)	0
J	Annual rehabilitation to disturbance ratio	1.45
K	Ecosystem and land use development (Ha) % Rehabilitation land to total mine footprint	0

Table 5: Progressive Achievement of Established Rehabilitation Calendar Year 2024

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

4.1 VARIATION TO THE REHABILITATION SCHEDULE

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

The rehabilitation forecast in the 2024 Forward Program was 81.2ha and the amount of rehabilitation progressing to Ecosystem and Land Use Establishment phase during the reporting period was 100.6ha.

The disturbance forecast in the 2024 Forward Program was 78.7ha and the amount of disturbance undertaken during the reporting period was 65.4ha. This included 11.8ha of rehabilitation disturbance.

The quantity of rehabilitation was greater than the forecast amount, with additional rehabilitation in the South Pit/CD areas offsetting less rehabilitation in the Tailings Dam 1 and North Pit areas.

The reduced amount of disturbance compared to the Forward Program forecast was due to disturbance ahead of mining being delayed in West Pit and North Pit.

Key factors that have delayed the progressive rehabilitation.

Finalisation of the rehabilitation of Tailings Dam 1 was not able to be completed during the reporting period due to inundation of the paddock-dumped material making it too difficult for bulk shape dozers to access. The delay to the Tailings Dam 1 rehabilitation was able to be offset by additional rehabilitation in South Pit/CD areas. Rehabilitation of Tailings Dam 1 is planned to be completed during 2025.

Outline actions to minimise disturbance and undertake progressive rehabilitation.

Dump scheduling has been undertaken by Medium Term Planning team to identify the timing of dump releases for the Forward Program period. Carryover of dump release and bulk shaped areas is planned each year to provide rehabilitation crews with consistent work through the year.
New disturbance is planned by Medium Term Planning team to minimise disturbance while supporting mine progression. Disturbance in West and North pit that was forecast to be disturbed in 2024 was delayed to avoid having areas cleared too far ahead of pre-stripping activities.

5.0 REHABILITATION MONITORING AND RESEARCH FINDINGS

5.1 REHABILITATION MONITORING

No rehabilitation monitoring was conducted at MTW during 2024 due to revised rehabilitation Performance Criteria still being developed. MTW is investigating the alignment of Performance Criteria with other companies in the Hunter Valley to enable sharing of monitoring data for reference sites in target vegetation communities. The revised Performance Criteria will be updated in the RMP and will form the basis of the rehabilitation monitoring that will be undertaken in 2025.

A total of 77 rehabilitation inspections were undertaken during 2024 to determine maintenance requirements related to vegetation establishment, weed management, water management and other management (i.e. disturbance, rubbish, vertebrate pest management etc.). These inspections were used to guide rehabilitation maintenance activities undertaken during 2024.

5.2 STATUS OF PERFORMANCE AGAINST REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

Previous monitoring methods incorporated and addressed the requirements specified in MTW RMP (2022). This included: a combination of plot-based monitoring in accordance with the NSW BioBanking Assessment Method (BBAM) (to assess native vegetation) together with walkover inspections of rehabilitation areas to detect potential issues occurring at the broader scale; Landscape Functional Analysis; soil assessment (chemical/nutrition and microbial); and native canopy development.

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

New rehabilitation areas completed since 2022 have not been included in the monitoring program due to monitoring being suspended while ROBJ's and Performance Criteria are being revised. However, these new areas have been covered by the rehabilitation inspection program to determine rehabilitation maintenance requirements.

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

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

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

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

Please select the best description of the appraisal

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

Summarise the findings of the Rehabilitation Monitoring Program

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

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

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

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

Identify any performance issues

The rehabilitation monitoring report (2022) outlines the following:

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

5.3 OUTCOMES OF REHABILITATION RESEARCH AND TRIALS

Table 6: List of Active Rehabilitation Research and Trials

No.	Project/Trial Name	Objective of Trial Project	Methodology	Expected Date of Completion
3	Transition to Native Trees/Shrub Using Selective Grass Herbicide (RRT0001149)	Transition areas that are dominated with exotic grasses to native vegetation.	Utilise selective grass herbicides to control exotic grasses, follow up sowing with native tree/shrub seed mixes to increase native vegetation establishment.	31/12/2027
4	Compost Type Trial (Spoil/Compost Application) (RRT0001150)	Rehabilitation trials to test if different types of compost result in improved native vegetation establishment in spoil/compost applications.	Application of 2 types of compost: Bettergrow (with Biosolids) and LOOP Biomix to a rehabilitation area with mine spoil as growth medium. Trial areas seeded with diverse native seed mix and monitored to detect differences in native vegetation establishment.	31/12/2027

Table 7: List of Inactive Rehabilitation Research and Trials

No.	Project/Trial Name	Objective of Trial Project	Methodology	Expected Date of Completion
1	Bursaria spinosa Germination trial (RRT0001088)	Germination testing: 1) if freezing pre-treatment of seed improves germination rates; and 2) if germination rates in MTW topsoil's and spoils are comparable to seed raising mix.	Subject seed to freezing temps pre-treatment and run a germination trial with the following treatments: Provenance 1(Hunter Valley) control/seed raising mix; Prov. 1 freeze treatment/seed raising mix; Prov. 1 freeze treatment/typical MTW topsoil; Prov. 1 freeze treatment/typical MTW spoil/ameliorant. Provenance 2(Coonabarabran) control/seed raising mix; Prov. 2 freeze treatment/seed raising mix; Prov 2 freeze treatment/typical MTW topsoil; Prov. 2 freeze treatment/typical MTW spoil/ameliorant.	30/11/2023

No.	Project/Trial Name	Objective of Trial Project	Methodology	Expected Date of Completion
2	Compost Type Trial (Spoil/Compost Application) (RRT0001089)	Rehabilitation trials to test if different types of compost result in improved native vegetation establishment in spoil/compost applications	Application of 3 types of compost: Remondis (coarse), Remondis (with fines), Bettergrow (with Biosolids) to a rehabilitation area with mine spoil as growth medium. Trial areas seeded with diverse native seed mix and monitored to detect differences in native vegetation establishment.	30/06/2024

Provide details about how the outcomes of completed trials and research have been used to influence rehabilitation planning and methodologies and/or continuously improve rehabilitation techniques

Trial RRT0001088 demonstrated that freezing pre-treatment improved the germination of Bursaria spinosa. Freezing pre-treatment is therefore recommended for this species. However, germination of Bursaria spinosa only occurred in the seed raising mix. No germination was observed in the MTW topsoil or spoil growth mediums that were provided for use in the trial. This indicates that there are further impediments to germination in the MTW rehabilitation environment that require further investigation.

In the spoil growth medium that the compost trial (RRT0001089) was conducted in, native vegetation establishment was improved in the plots that utilised higher nutrient composts (i.e. Remondis (with fines) and Bettergrow (with Biosolids)). MTW has adopted the use of high nutrient composts in spoil/compost areas where mine spoil rather than topsoil is used as the growth medium. A follow-up trial (RRT0001150) of two different types of high nutrient compost will be conducted in a future spoil/compost rehabilitation area.

Appendix 8:

Local and Regional Biodiversity Areas Annual Compliance Reports



Local Biodiversity Areas

Annual Report 2024

Annual report for the period from January to December 2024, for activities described in the Management Plans for all Local Warkworth Mining Limited offsets including:

- Southern Biodiversity Area (including the Putty Road Offset Area)
- Northern Biodiversity Area

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6 Adaptive Management 21

Revision

Version No.	Version Details	Document Status	Date
1.0	**Environment and Community Advisor**	**Final**	**31/03/2025**

1 INTRODUCTION

This annual report is a requirement of the management plans for all Local Warkworth Mining Limited offsets for the 2024 reporting period (1 January 2024 to 31 December 2024).

The report provides a summary of the key management activities completed across the biodiversity offset located within the Southern (includes the Putty Road Offset Area) and Northern Biodiversity Areas (BAs).

The management plans describe the conservation management strategies and monitoring to achieve, and measure improvement and protection of the offset's biodiversity values. It is a compliance requirement of the Commonwealth and NSW environmental approvals to implement the management plans.

The Local OMP (November 2014) was prepared to satisfy the consent requirements for the New South Wales (NSW) Warkworth Mine Development Approval (DA 300-9-2002i) and replaces the former *Flora and Fauna Management Plan* and *Warkworth Sands Woodland (WSW) Offset Area OMP*. In November 2015 the NSW Warkworth Continuation Project Approval (SSD-6464) was granted providing both NSW and Commonwealth approval for the same disturbance area. Phase 2 of the EPBC2009/5081 action also commenced on 16 February 2016. In response to the granting of these new approvals, new Management Plans for the Southern and Northern BA have been prepared to satisfy the Commonwealth approval EPBC2009/5081 and the NSW consent (SSD-6464), replacing both the Local and Putty Road OMPs.

The Biodiversity Offset Portal contains the supporting documentation for this report, including photo point monitoring. Access to the portal is restricted, relevant regulators have been provided with login details; please contact Mount Thorley Warkworth should you require assistance.

2 LOCATION AND LANDHOLDER DETAILS

The locations of the local BAs are shown in **Figure 1**, **Figure 2** and **Figure 3**, details are provided in **Table 1**.

Table 1 Local Biodiversity Areas

Biodiversity Area	Land Owner	Area (ha)	Offset Area (ha)	Location
Northern BA	Coal & Allied Operations Pty Ltd	344	341	Approximately 7km north of the Warkworth Mining Lease and in close proximity to the Hunter Valley Operations. Accessed via Comleroi Road.
Southern BA (including the Putty Road Offset)	Coal & Allied Operations Pty Ltd Miller Pohang Coal Company Pty Ltd Warkworth Mining Limited	1,023	986	Immediately west and north of Warkworth Mine. Intersected by Putty Road in the south, and Wallaby Scrub Road and the Golden Highway in the north.

Location of the Warkworth Mining Limited Biodiversity Areas

Annual Compliance Report

Figure 1

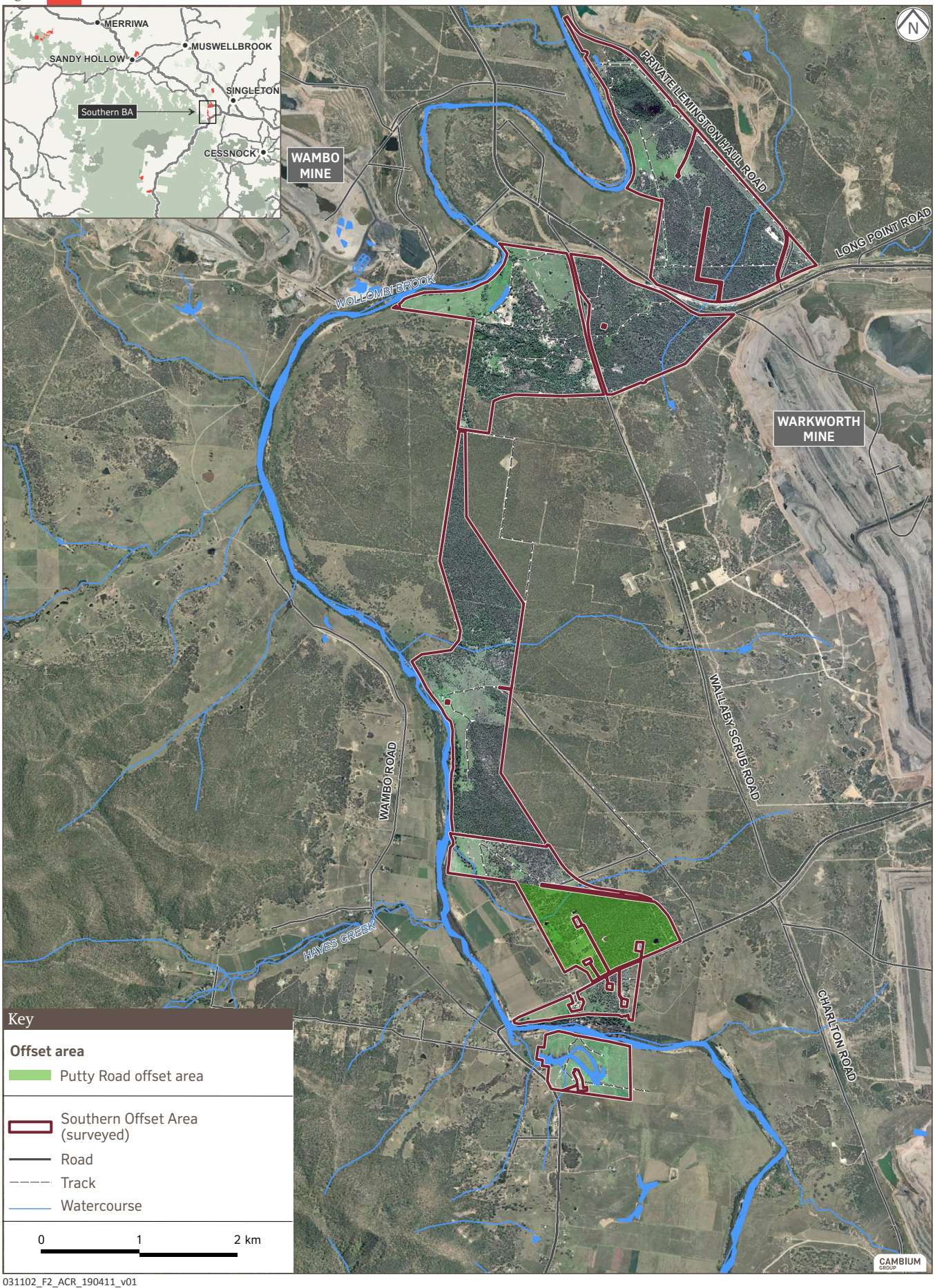


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Southern Biodiversity Area - Putty Road offset area

Annual Compliance Report

Figure 2

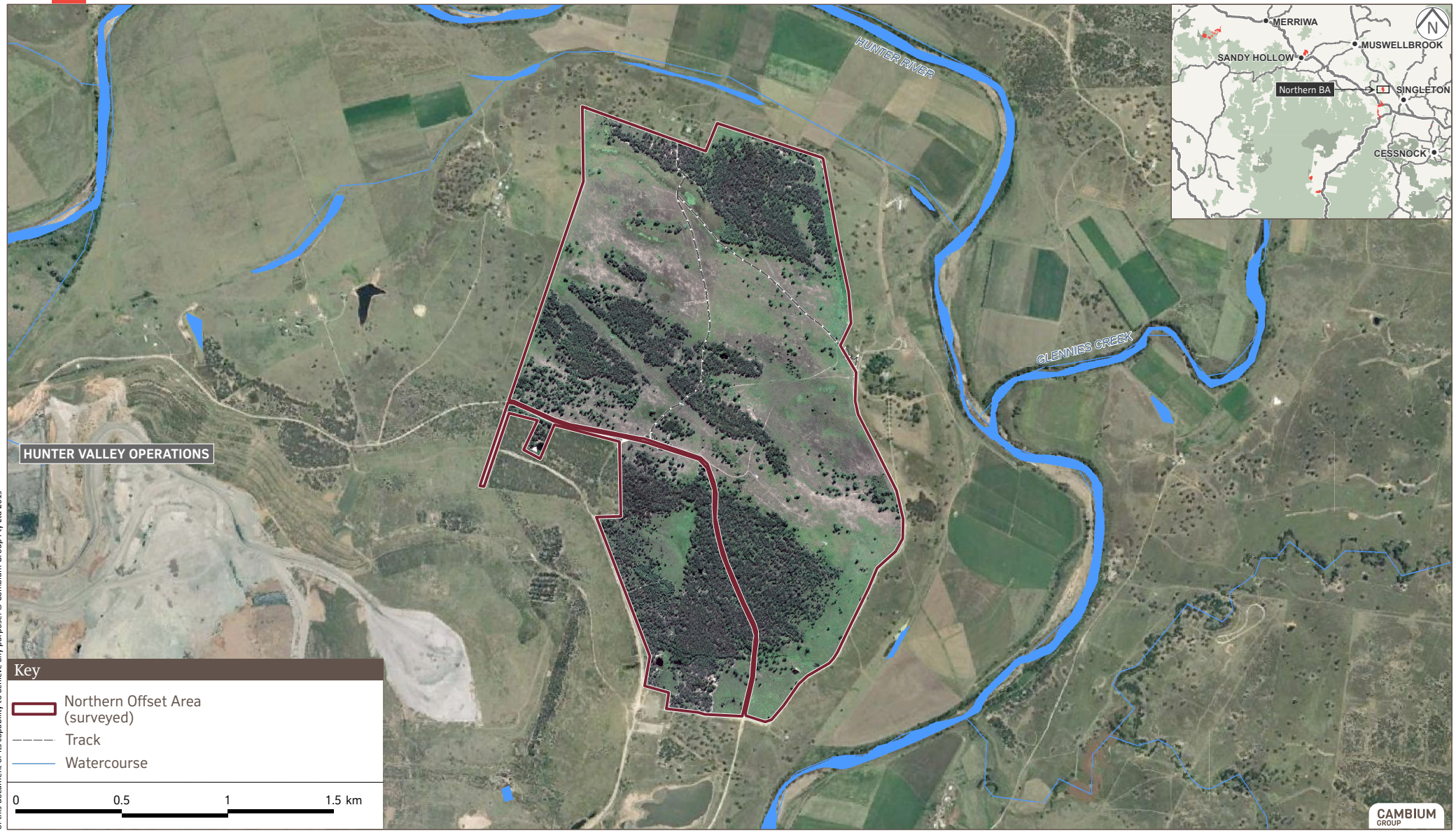


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Northern Biodiversity Area

Annual Compliance Report

Figure 3



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3 SUMMARY OF ACTIVITIES – 2024

Table 2 provides a summary of the activities undertaken during the reporting period (Year 8) and the progress in attaining the Performance Criteria for the key Conservation Management Strategies in the management plans.

3.1 Summary of climatic conditions

Figure 4 and **Figure 5** show the monthly actual rainfall compared to the long-term average for the Northern BA and Southern BA for the reporting period. In 2024, rainfall was above average for February, April, May, June, July and August, with relatively minimal rainfall in March and December and close to or below average for remaining months. The Southern BA received ~707mm of rainfall which was ~10mm above the long-term average and the Northern BA received ~699mm which was ~24mm above the long-term average.

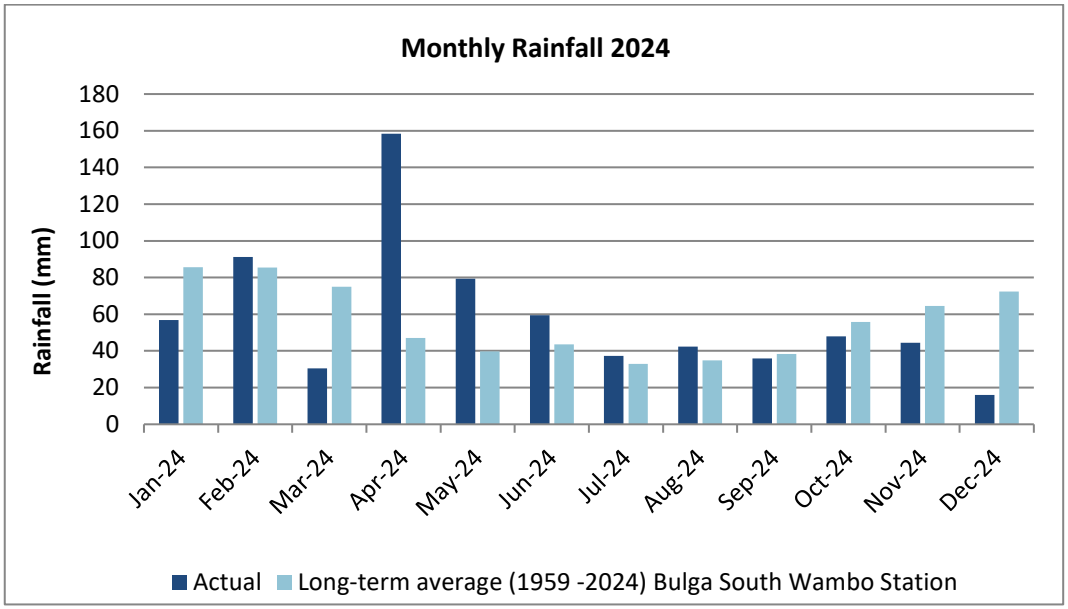


FIGURE 4 MONTHLY RAINFALL – NORTHERN BA

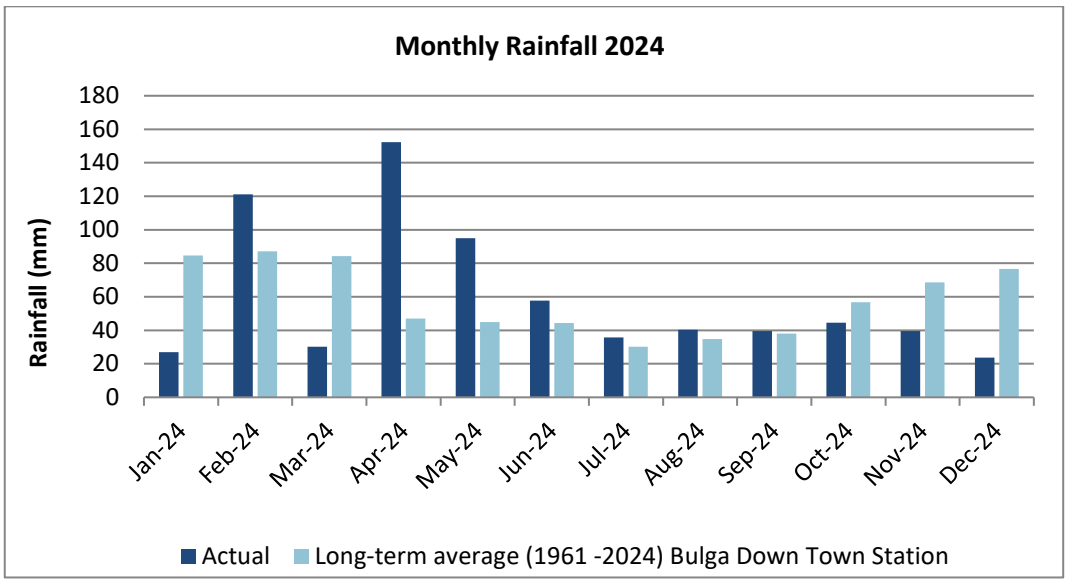


FIGURE 5 MONTHLY RAINFALL –SOUTHERN BA

Table 2 Summary of progress against Performance Criteria

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
ACTIVE RESTORATION				
Southern BA WSW planting (40ha)				
Performance Criteria	*Collection of seed. Plant propagation. Tubestock planted.* *Completed survival assessment.*	*Biennial ecological monitoring completed*	*Ecological monitoring demonstrates a trajectory toward the reference site or the benchmark values for HU872 for all attributes measured over the three consecutive assessments (the average of all plots).*	
Activity / Progress	Seed collection and plant propagation was undertaken. In 2017 1ha of WSW tubestock was planted in the Southern BA. In 2018 14 ha of WSW tubestock was planted in the Southern BA including replanting the sand quarry and old orchard areas. In 2019 maintenance of planting areas was undertaken and included infill planting of over 9,000 tubestock. In 2020 maintenance of planting areas was undertaken and included infill planting of over 2,000 tubestock. Survival assessments were completed for all planting areas.	Seed collection and plant propagation was undertaken. In 2022 planting of tubestock included 3,000 WSW tubestock in the grassland area of Southern BA1 and infill planting of 4,400 tubestock throughout the Southern BA. Ecological monitoring undertaken in 2022 and 2024. In 2023 planting of tubestock included 800 WSW tubestock in the grassland area of Southern BA1. In 2024, WSW planting progressed with ~5000 m^3 of WSW sand stripped from ahead of mining at MTW and hauled to the Southern BA3. This WSW sand was spread, seeded with native grasses and then 4,000 WSW tubestock were planted into the planting areas. Survival assessment completed for planting areas.		Propagate plants. Undertake survival assessments. Undertake infill planting to restore Warkworth Sands Woodland in the Southern BA.

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
Southern BA CHGBIW planting (240ha)				
Performance Criteria	*Collection of seed. Plant propagation. Tubestock planted.* *Completed survival assessment.*	*Biennial ecological monitoring completed.*	*Ecological monitoring demonstrates a trajectory toward the reference site or the NSW Biometric HU817 for all attributes measured over three consecutive assessments (the average of all plots).*	
Activity / Progress	Seed collection and plant propagation was undertaken. Restoration activities included tubestock planting of Central Hunter Grey Box – Ironbark Woodland in the Southern BA. In 2017, 89 ha of the Southern BA was planted with over 13,000 tubestock planted into rip lines. In 2018 118 ha of the Southern BA was planted with over 20,000 tubestock planted into rip lines. In 2019 maintenance of planting areas was undertaken and included infill planting of over 10,000 tubestock. In 2020 maintenance of planting areas was undertaken and included infill planting of over 3,800 tubestock. In 2021 maintenance of planting areas was undertaken and included infill planting of 9,000 tubestock. The site preparation for these sites included ripping by dozer and weed control. To mimic nature the tree species were planted at a spacing of 5 -10m and shrubs species planted in clumps as commonly found with understory species within this vegetation type. All plants were watered, fertilised and protected with a tree guard. Survival Assessments were completed for all planting areas.	Seed collection and plant propagation was undertaken. In 2022 maintenance of planting areas was undertaken and included infill planting of 7,000 tubestock. In 2024 maintenance of planting areas was undertaken and included infill planting of 4,780 tubestock. Ecological monitoring undertaken in 2022 and 2024. Survival assessment completed for planting areas.		

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
Southern BA ROF planting (26ha)				
Performance Criteria	*Collection of seed. Plant propagation. Tubestock planted.* *Completed survival assessment.*		*Survival assessment greater than 70%*	
Activity / Progress	Seed collection and plant propagation was undertaken. Restoration activities included planting River Oak Forest in the Southern BA. In 2018, 11ha of the Southern BA was planted with over 2,000 tubestock planted into rip lines. In 2019 maintenance of planting areas was undertaken and included infill planting of over 800 tubestock. In 2020 maintenance of planting areas was undertaken and included infill planting of 3,200 tubestock. In 2021 maintenance of planting areas was undertaken and included infill planting of 4,000 tubestock. The site preparation for this site included ripping by dozer and weed control. To mimic nature the tree species were planted at a spacing of 5 -10m and shrubs species planted in clumps as commonly found with understory species within this vegetation type. All plants were watered, fertilised and protected with a tree guard. Survival Assessments were completed for all planting areas.	In 2022 maintenance of planting areas was undertaken and included infill planting of 5,000 tubestock. In 2024 maintenance of planting areas was undertaken and included infill planting of 1,460 tubestock. Seed collection and plant propagation was undertaken. Survival assessment completed for planting areas.		

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
Northern BA WSW planting (195ha)				
Performance Criteria	*Collection of seed. Plant propagation. Tubestock planted.* *Completed survival assessment.*	*Biennial ecological monitoring completed.*	*Ecological monitoring demonstrates a trajectory toward the reference site or the benchmark values for HU872 for all attributes measured over three consecutive assessments (the average of all plots).*	
Activity / Progress	Seed collection and plant propagation was undertaken. Restoration activities included planting Warkworth Sands Woodland in the Northern BA. In 2014 work commenced to restore over 80 hectares of Warkworth Sands Woodland, this involved the planting of seedlings and the relocation of sand salvaged ahead of mining activities. In 2017, 10,800 tubestock were planted into 44 50x50m patches. Topsoil from ahead of mining operations at MTW was salvaged and hauled to the Biodiversity Area prior to planting commencing. In total Ten patches received 50mm of topsoil over the whole patch, two received 50mm of topsoil over half the patch, 12 received 25mm of topsoil over the patch and ten received no topsoil. Holes were dug for tubestock, either by hand or auger and all plants were watered, fertilised and protected with a tree guard. In 2018 maintenance of planting areas was undertaken and included infill planting of over 8,000 tubestock. In 2019 maintenance of planting areas was undertaken and included infill planting of over 3,000 tubestock. In 2020 planting progressed at the Northern BA with 9,112m³ of WSW sand stripped ahead of mining at MTW and hauled to the Northern Biodiversity Area. 5,480m³ of this WSW sand was spread into strips and seeded with native grasses to increase the groundcover diversity then planted with 4,500 tubestock	Seed collection and plant propagation was undertaken. In 2022 maintenance of planting areas was undertaken and included infill planting of 3,400 WSW tubestock. Ecological monitoring undertaken in 2022 and 2024. Planting of 10,000 Warkworth Sands Woodland tube stock was delayed due to access issues transporting sand into the planting areas, this was rescheduled for 2023. In 2023, WSW planting progressed with ~5,000 m³ of WSW sand stripped from ahead of mining at MTW and hauled to the Northern Biodiversity Area. This WSW sand was spread into strips and more broadly in some areas, seeded with native grasses and then 10,000 WSW tubestock were planted into the planting areas. In 2024, WSW planting progressed with ~13,000 m³ of WSW sand stripped from ahead of mining at MTW and hauled to the Northern Biodiversity Area. This WSW sand was spread into strips and more broadly in some areas, seeded with native grasses and then 15,100 WSW tubestock were planted into the planting areas. Survival Assessments were completed for planting areas.		Propagate plants. Undertake track maintenance to allow sand to be transported to the planting areas. Spread topsoil from ahead of mining operations at MTW into the Northern BA planting areas. Undertake planting of Warkworth Sands Woodland tube stock. Undertake survival assessments.

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
	In 2021 WSW planting progressed with 3,632 m^3 of sand from ahead of mining at MTW spread into strips and seeded with native grasses then planted with 1,500 tubestock. Survival Assessments were completed for all planting areas A separate Ecological monitoring program was undertaken in 2021 to capture the WSW planting areas.			
Northern BA CHGBIW planting (23ha)				
Performance Criteria	*Collection of seed. Plant propagation. Tubestock planted.* *Completed survival assessment.*	*Biennial ecological monitoring completed.*	*Ecological monitoring demonstrates a trajectory toward the reference site or the NSW Biometric HU817 for all three attributes measured over three consecutive assessments (the average of all plots).*	
Activity / Progress	Restoration activities included tubestock planting of Central Hunter Grey Box – Ironbark Woodland in the Northern BA. In 2017, 6ha of the Northern BA was planted with 2,780 tubestock planted into rip lines. The site preparation for this site included ripping by dozer and weed control. To mimic nature the tree species were planted at a spacing of 5 -10m and shrubs species planted in clumps as commonly found with understory species within this vegetation type. All plants were watered, fertilised and protected with a tree guard. In 2018 maintenance of planting areas was undertaken and included infill planting. Survival Assessments were completed for all planting areas.	Ecological monitoring undertaken in 2022 and 2024.		

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
PASSIVE RESTORATION				
Weed control and monitoring				
Performance Criteria	*At least two weed control events each year for species listed in Table 14 of Management Plans* *and other weeds recorded from monitoring activities.* *All actions recorded in Annual Report.* *Complete Rapid Condition Assessments and* *Property Inspections.*	*At least one weed control event each year for species listed in Table 14 of Management Plans and other weeds recorded from monitoring activities.* *All actions recorded in Annual Report.* *Complete Rapid Condition Assessments and Property Inspections.*	*Ecological monitoring data indicates a trajectory for reduction in exotic plant cover over three consecutive assessments.*	
Activity / Progress	Weed contractor engaged to undertake weed control activities at the Northern and Southern BA throughout the year. Rapid Condition Assessment and Property Inspections were completed.	In 2024 weed control targeted the following species: African boxthorn (*Lycium ferocissimum),* African lovegrass *(Eragrostis curvulva),* African olive (*Olea europaea),* Aloe vera *(Aloe barbadense),* Balloon vine *(Cardiospermum grandiflorum),* Bidens (*Bidens pilosa),* Black locust *(Robinia pseudoacacia),* Blackberry nightshade *(Solanum nigrum),* Blue heliotrope *(Heliotropium amplexicaule),* Brazilian nightshade (*Solanum seaforthianum),* Brome grass *(Bromus catharticus), Cats claw creeper (Dolichandra unguis-cati),* Common evening primrose *(Oenothera biennis),* Coolatai grass (*Hyparrhenia hirta),* Couch grass *(Elymus repens),* Creeping pear *(Opuntia humifusa),* European olive *(Olea europaea),* Fireweed *(Senecio madagascariensis),* Galenia (*Galenia pubescens),* Golden wreath wattle (*Acacia saligna),* Green cestrum (*Cestrum parqui),* Inkweed (*Phytolacca octandra),* Lantana *(Lantana camara),* Lily of the Nile (*Agapanthus sp.*), Mother of millions (*Bryophyllum delagoense),* Moth vine (*Araujia sericifera),* Paterson's curse (*Echium plantagineum),* Potato vine *(Solanum seaforthianum),* Prickly pear (*Opuntia stricta),* Rhodes grass *(Chloris gayana),* Rye grass *(Lolium sp.),* Silky oak		Control noxious species and stop weeds spreading into previously un-infested areas. Undertake Rapid Condition Assessments. Undertake Property Inspections.

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
		(Grevillea robusta), Silverleaf nightshade *(Solanum elaeagnifolium),* Stinking roger (*Tagetes minuta),* Teddy bear vine *(Cyanotis beddomei),* Telegraph weed *(Heterotheca grandiflora),* Toadflax *(Linaria vulgaris),* Tree of Heaven *(Ailanthus altissima),* Turkey rhubarb *(Rumex sagittatus),* Wild oats *(Avena fatua),* Vipers bugloss (*Echium vulgare)* Rapid condition assessments and property inspections were completed.		
Pest control and monitoring				
Performance Criteria	*At least two control events each year for species listed in Table 20 of Management Plans, and any other species recorded from monitoring activities.* *Active participation in programme coordinated by Hunter Local Land Service (HLLS), this may include local control actions.* *Complete biannual inspection and report all works completed and actions for next year.*	*At least one control events each year for species listed in Table 17 of Management Plans, and any other species recorded from monitoring activities.* *Active participation in programme coordinated by HLLS, this may include local control actions.* *Complete biannual inspection and report all works completed and actions for next year.*	*No observed vertebrate pest or damage.* *Ecological monitoring demonstrates a trajectory to benchmark values for all attributes measured over three consecutive assessments (the average of all plots).*	
Activity / Progress	Vertebrate pest contractor was engaged to undertake programmes across the Southern and Northern BA. Biannual property inspections were undertaken.	In 2022 a vertebrate pest contractor was engaged to undertake programmes across the Southern and Northern BA. In 2023, 1080 ground baiting programmes were undertaken targeting wild dogs and foxes in autumn and spring, across the Southern and Northern BA. Both programmes were coordinated with HLLS and neighbouring landholders across the broader Hunter Valley area. In 2023, a trapping program was undertaken targeting pigs in Spring, across MTW and the Southern BA. In 2024, 1080 ground baiting programmes were undertaken targeting wild dogs and foxes in autumn and spring, across the Southern and		Undertake vertebrate pest management including 1080 ground baiting programmes scheduled for autumn and spring to target wild dogs and foxes. Undertake pig trapping and baiting program across MTW and the Southern and Northern BA's. Undertake biannual property Inspections.

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
		Northern BA. Both programmes were coordinated with HLLS and neighbouring landholders across the broader Hunter Valley area. In 2024, a ground baiting program and a trapping/ground baiting program were undertaken in Autumn and Winter respectively, targeting pigs across MTW and the Southern and/or Northern BA's. Biannual property inspections were undertaken.		
Grazing				
Performance Criteria	*Grazing is conducted in accordance with the Management Plan.* *Boundary fences maintained.* *Complete Rapid Condition Assessment and Property Inspections.*			
Activity / Progress	No strategic grazing was undertaken in the BAs in 2024. Boundary fence repairs/replacements undertaken in the Southern BA. Property Inspections and Rapid Condition Assessments were undertaken in 2024.			Undertake Property Inspections. Undertake Rapid Condition Assessments. Maintain boundary fences.
Bushfire Management Plan (BFMP), Ecological burn and monitoring				
Performance Criteria	*Actions implemented.* *Review and revise if required.* *Complete Rapid Condition Assessments and* *Property Inspections.*	*Actions implemented.* *Review and revise if required.* *Complete Rapid Condition Assessments and Property Inspections.* *Completed ecological fire management plan for MZ1, MZ3, MZ5, MZ7, MZ8 and MZ9.*	*All required actions of BFMP have been implemented.* *BFMP has been reviewed annually and revised if required.*	

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
Activity / Progress	BFMP reviewed. Firebreaks were slashed. Property Inspections and Rapid Condition Assessments were undertaken.	BFMP reviewed. Firebreaks were slashed at the Southern BA in 2023 and 2024. Areas were also slashed at Northern BA related to planting preparation activities, but which also served as firebreaks. Property Inspections and Rapid Condition Assessments were undertaken in 2022, 2023 and 2024.		Review BFMP. Undertake Property Inspections. Undertake Rapid Condition Assessments. Undertake fuel load assessments. Slash firebreaks.
Infrastructure Improvements and monitoring				
Performance Criteria	*Completed GDP for all infrastructure improvement actions.* *Maintenance of tracks and fences completed at least every 3 years.* *Property Inspections undertaken.*			.
Activity / Progress	GDP completed for WSW planting programs in the Southern and Northern BA in 2024. Boundary fences maintained, and Property Inspections undertaken in 2024.			Maintain tracks and boundary fences. Undertake Property Inspections
Erosion monitoring inspections and reports				
Performance Criteria	*Complete Rapid Condition Assessment and Property Inspections*			
Activity / Progress	Rapid Condition Assessments and Property Inspections undertaken in 2024. An erosion area was identified at the Southern BA and repair works required have been assessed.			Undertake Rapid Condition Assessments. Undertake Property Inspections. Monitor/repair erosion area identified in SBA5
Dam conversion and rehabilitation and monitoring				
Performance Criteria	*Prepare dam conversion plan.* *Dam conversion complete and rehabilitation has stabilised the site.* *Property inspections.*	*Observed natural flow regime and no erosion.* *Property inspections.*	*All works completed.*	
Activity / Progress	Property inspections undertaken. Dam conversion plan prepared.	Property inspections undertaken.		Implement actions from dam conversion plan. Undertake Property Inspections.

Conservation Actions	Year 1 to Year 5	Year 6 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
Natural Regeneration and monitoring				
Performance Criteria	Annual weed control, vertebrate pest and fire management actions implemented as per management plans. *Complete Rapid Condition Assessments and Property Inspections.*		*Ecological monitoring demonstrates a trajectory to benchmark values for all attributes measured over three consecutive assessments (the average of all plots).*	
Activity / Progress	Actions implemented in 2024 as per management plans. Rapid Condition Assessments, Ecological Monitoring and Property Inspections undertaken in 2024.			Undertake Property Inspections. Undertake annual weed control. Undertake Rapid Condition Assessments.
Controlled Activities				
Performance Criteria	*No reported incidents of prohibited actions undertaken Yancoal, contractors, consultants or other agents of Yancoal.* *Any clearing of vegetation reported in Annual Report.* *Signage and locks (where required) maintained.* *Complete risk assessment for any recreation activities.* *All occupants of residents compliant with requirements of the MP.* *No Cultural Heritage sites knowingly disturbed and any protective barricading maintained.* *Damaged and unwanted fences removed.* *All Property Inspections completed.*			
Activity / Progress	In 2017 trespassing and illegal tree clearing and timber getting within the Southern Biodiversity Area resulted in felling approximately 40 full sized trees and 100 small trees. This unauthorised activity was reported to both Department of Environment and Energy and Department of Planning and Environment in October 2017. Internal fences and waste were removed from the Southern BA areas to be planted in 2018 and sections of boundary fence at the Northern BA and Southern BA were repaired and replaced where needed. New Biodiversity Area signs were installed in 2017. In 2024 there were no reported incidents or prohibited actions undertaken on the Biodiversity Areas. In 2023, sections of boundary fence at the Northern BA and Southern BA were repaired and replaced where needed. In 2024, sections of boundary fence and a gate at the Southern BA were repaired and replaced where needed. Regular property inspections were undertaken.			Undertake Property Inspections.

4 MONITORING ACTIVITIES

The following table provides a summary of the monitoring activities undertaken as detailed in the MP. Monitoring reports and results are available on the Biodiversity Offset Portal.

Table 3 Monitoring Activity Summary

Monitoring	2024	Date/s	Completed by
Bird Assemblage	X	July – November 2024, next due July – October 2026	Future Fauna
Habitat Restoration	X	September - November 2024, next due September – November 2026	Mosaic Ecology and Leaf ERC
Rapid Condition Assessment	X	September and December 2024, next due September – November 2025	Franks Fencing (Land Management Advisor)
Property Inspection	X	April/May/November 2024, next due April/November 2025	Environment and Community Advisor

4.1 Bird assemblages monitoring

Bird assemblage monitoring is undertaken every two years as part of the ecological monitoring requirements to assess changes in the condition and extent of the woodland habitats within the BAs and the ongoing usage of these habitats by woodland birds, including the critically endangered regent honeyeater and swift parrot.

Previous bird monitoring methodology (2014 – 2018) included two-hectare, 20-minute area searches with one visit to each monitoring site during winter and early spring. In 2020 the bird monitoring methodology changed to increase site visits so that each site was visited three times between July and October, to cover the period when swift parrots and regent honeyeaters are most likely to be present. The maximum count of all bird species detected visually or audibly during the survey period and within the boundaries of each survey site were recorded. Data from the 2020 monitoring program demonstrated that three visits to each monitoring site is sufficient to record most bird species regularly occupying the monitoring sites.

In 2022 eighteen new monitoring sites were added to the monitoring programme to help increase the likelihood of detecting regent honeyeaters or swift parrots occupying the BAs.

In 2024 a total of 120 species were recorded throughout the eight Biodiversity Areas representing an increase of seven species compared to 2022 data. A total of 10 threatened bird species were detected during surveys. Relative to 2022, species richness increased slightly at Northern and Southern Biodiversity Areas. Bird abundance measures were mixed with slight increases at Southern BA and slight decreases at Northern BA.

The following are the recommendations and discussion summaries for the Local Biodiversity Areas.

Northern BA

After three visits, a total of 35 bird species were detected during standardised surveys, which equals the 2022 count. After one visit, overall species richness was higher in 2024 (49) than in all previous years. Grey-crowned babbler was again the only threatened species detected during standardised surveys in Northern BA in 2024. Noticeably high

numbers of small woodland birds including Rufous whistlers, Western gerygones and various Thornbill species were recorded around restoration plantings. Similar to Southern BA, there was no eucalypt or mistletoe blossom, which likely suppressed the number of nectarivorous species present during surveys.

Noisy miner numbers remain high in the Northern BA, with counts at all sites ranging from 2 – 15 individuals.

Management recommendations include continuation of planting works and consideration of noisy miner management.

Southern BA
After three visits, a total of 64 bird species were detected during standardised surveys. This represents a slight increase in species richness on previous years. Three threatened species were detected: Speckled warbler, Grey-crowned babbler and Varied sittella. No Dusky woodswallows or Little eagles were detected in 2024 as they were in 2022. Red-capped robin numbers have increased in Southern BA since they were detected for the first time there in 2022.

There was very little eucalypt or mistletoe flowering and no apparent lerp infestations within the Southern BA during 2024 surveys. Impact of feral species appears to have remained low relative to previous years. Evidence of rabbit abundance was generally low and there were fewer signs of fresh pig tracks than have been noted in previous years.

Young plantings are steadily improving and will offer improved habitat for small woodland birds over the coming years as they continue to mature.
Management recommendations include continuation of planting works.

4.2 Habitat restoration monitoring

This study completes the fifth round of habitat restoration monitoring for the Southern BA and the sixth for the Northern BA. A separate monitoring program was undertaken across the Northern BA in Spring 2021 and included an additional eight transitional plots to capture the WSW planting activities undertaken between 2014 - 2021. The habitat restoration monitoring programme assesses the changes in key attributes within the BA through time as grassland communities are restored to woodland. The following are the recommendations and discussion summaries for the Local Biodiversity Areas.

2024 monitoring results indicate that the reference sites are in relatively good condition considering the history of disturbance whereas the transition sites, whilst improving, generally have attributes that are below the reference mean values.
The Grey Box Ironbark woodland reference sites attributes were variable across the plots. The mean values were above Benchmark for Species richness, Overstorey cover, ground layer grasses and fallen logs. Exotic plant cover was quite low (below 1%) at all sites.

The Grey Box Ironbark transition sites generally show lower attribute scores when compared to reference sites. For most sites native species richness is comparable to the reference minimum values, although well below the mean values. Native grasses contribute the most to species diversity. Native plant cover scores are also usually low compared to reference mean values (except for native grass cover). Many sites achieve

scores above the reference site minima and some had scores within the Benchmark range. Many calculated mean scores were above the reference site minima but only native ground layer (grass) cover achieved the reference mean value. Overstorey regeneration is evident in the <10cm (Diameter at Breast Height) category, both from planting activities and natural regeneration. The CHGBIW Transition 3 plot failed to achieve any of the reference attributes. This site is situated in a depression which was flooded for several months during 2022.

Warkworth Sands Woodland reference sites mean values achieved the Benchmark range for five of the eight attributes. Cover was generally above Benchmark for the Overstorey and ground layer grasses attributes but did not achieve the Benchmark for mid storey plants or the ground layer plants shrubs and other attributes. Exotic plant cover was variable, with the mean score being 2.2 percent, which is a reduction from the 2022 monitoring round. Fallen logs were often below Benchmark but the mean value is comparable to the Benchmark at 85 percent of the minimum. 115 native species were recorded in WSW plots, representing 50 families.

Warkworth Sands woodland transition sites total native species richness is low compared to reference mean values. Native species diversity is spread across all vegetation categories but is largely lower than the corresponding reference mean value. Native plant cover scores are also usually low compared to reference mean values except in the native ground layer (other) category which is patchy. Some sites achieve scores above the reference site minima and several calculated mean scores were above the reference site means. Recent plantings, soil translocation and direct seeding have increased biodiversity and total stems in many plots but the plants were generally too small to significantly increase canopy cover.

Vegetation at the Hunter Lowland Redgum Forest plots showed a decline in individual plot and mean values from 2022, maintaining Benchmark for three of eight key attributes. 60 native species were recorded in HLRF plots, representing 35 families.

Management recommendations include:

- Pest management for feral pigs and rabbits.

- Weed management to reduce priority weeds and planting to increase the diversity of native canopy and mid-storey species.

- Consideration of selectively thinning sites with high stem densities of more than 1000/Ha to decrease competition and increase total length of logs on the ground and artificial tree hollows.

5 PROGRESS IN ATTAINING CONSERVATION OBJECTIVES AGAINST KEY PERFORMANCE INDICATORS

The primary conservation objectives for the local offset areas (including the Putty Road Offset) are to:

- enhance biodiversity values across the BAs;
- protect the WSW Offset Area and Putty Road Offset Area under a legally binding conservation covenant;
- increase the condition of WSW and Ironbark EECs and observe a transition from grassland to woodland;
- enhance habitat and foraging opportunities for the woodland birds; and
- contribute to and enhance the existing network of protected vegetation within the Hunter Valley.

Table 2 indicates the progress in attainment of the long-term conservation objectives, the ecological monitoring data supports the continued implementation of the conservation management strategies.

6 ADAPTIVE MANAGEMENT

No new environmental risks have been identified during the reporting period.

Table 4 Local Offset Areas Biodiversity Values and Key Performance Indicators

Area	Biodiversity Value	Description and baseline metric	KPI	Progress comment
Southern BA	Ironbark Woodland	Total area: 446.7ha RCA Average Health rating 18/20 (MZ1)	Extent and condition of woodland over 10 years.	RCA results: 2014 – 18/20 2015 – 18/20 2016 – 18/20 2017 – 18.5/20 2018 – 18.5/20 2019 – 18/20 2020 – 17.5/20 2021 – 17.5/20 2022 – 18/20 2023 – 18/20 2024 – 18/20 Area and health maintained.
	Ironbark Grassland	Total area: 258.4ha	Transition of grassland to woodland.	2024 monitoring supports continued implementation of the conservation management strategies.
	WSW	Total area: 137ha RCA Average Health rating 17.1/20 (MZ3)	Extent and condition of woodland over 10 years.	RCA results: 2014 – 16/20 2015 – 18/20 2016 – 17/20 2017 – 18/20 2018 – 18/20 2019 – 18/20 2020 – 17/20 2021 – 17/20 2022 – 16/20 2023 – 16/20 2024 – 17/20 Area and health maintained.

Area	Biodiversity Value	Description and baseline metric	KPI	Progress comment
	WS Grassland	Total area:40.3ha	Transition of grassland to woodland.	2024 monitoring supports continued implementation of the conservation management strategies.
	Hunter Lowland Red Gum Forest	Total area: 32.4ha RCA Average Health rating 18.4/20 (MZ5)	Extent and condition over 10 years.	RCA results: 2014 – 17/20 2015 – 19/20 2016 – 19/20 2017 – 19/20 2018 – 18.5/20 2019 – 18.5/20 2020 – 19/20 2021 - * 2022 - * 2023 – 18/20 2024 – 18/20 *Sites were inaccessible due to flooding
	Fauna Habitat	Low potential habitat	Observe maintenance or increase habitat condition rating over 10 years	2024 monitoring supports continued implementation of the conservation management strategies.

Area	Biodiversity Value	Description and baseline metric	KPI	Progress comment
Northern BA	Ironbark Woodland	Total area: 103.6ha RCA Average Health rating 18.6/20 (MZ1)	Extent and condition of woodland over 10 years.	RCA results: 2014 – 18/20 2015 – 18.5/20 2016 – 19.5/20 2017 – 19.5/20 2018 – 18/20 2019 – 18/20 2020 – 19/20 2021 – 19/20 2022 – 18.5/20 2023 - 18.5/20 2024 – 18/20 Area and health maintained.
	Ironbark Grassland	Total area: 23.1ha	Transition of grassland to woodland.	2024 monitoring supports continued implementation of the conservation management strategies.
	WSW	Total area: 19.5ha RCA Average Health rating 18.5/20 (MZ3)	Maintain woodland extent over 10 years.	RCA results: 2014 – 17.5/20 2015 – 18/20 2016 – 19/20 2017 – 19/20 2018 – 18.5/20 2019 – 18.5/20 2020 – 19/20 2021 – 18.5/20 2022 – 18.5/20 2023 – 18.5/20 2024 – 18.5/20 Area and health maintained.
	WS Grassland	Total area: 194.5	Transition of grassland to woodland	2024 monitoring supports continued implementation of the conservation management strategies.

Area	Biodiversity Value	Description and baseline metric	KPI	Progress comment
	Fauna Habitat		Observe maintenance or increase habitat condition rating over 10 years	2024 monitoring supports continued implementation of the conservation management strategies.



Regional Biodiversity Areas

Annual Report 2024

Annual report for the period from January to December 2024, for activities described in the Management Plans for all regional Warkworth Mining Limited offsets including:

- Goulburn River Biodiversity Area
- Seven Oaks Biodiversity Area
- Bowditch Biodiversity Area
- Putty Biodiversity Area
- Condon View Biodiversity Area
- North Rothbury Biodiversity Area

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Revision

Version No.	Version Details	Document Status	Date
1.0	**Environment and Community Advisor**	**Final**	**31/03/2025**

1 INTRODUCTION

This annual report is a requirement of the Management Plans for all regional Warkworth Mining Limited offsets for the 2024 reporting period from 1 January through to 31 December 2024.

The annual report provides a summary of the key management activities completed across the biodiversity offsets located within the Goulburn River, Seven Oaks, Bowditch, Putty, Condon View and North Rothbury Biodiversity Areas (BAs).

The management plans describe the conservation management strategies and monitoring to achieve, and measure improvement and protection of the offset's biodiversity values. It is a compliance requirement of the Commonwealth and NSW environmental approvals to implement the management plans.

The Regional Offset Management Plan (ROMP) was prepared to satisfy the consent requirements for the New South Wales (NSW) Hunter Valley Operations (HVO) South Project Approval (PA 06_0261) and the Warkworth Mine Commonwealth EPBC 2002/629 Approval. In November 2015, the NSW Warkworth Continuation Project Approval (SSD-6464) was granted providing both NSW and Commonwealth approval for the same disturbance area. Phase 2 of the EPBC2009/5081 action also commenced on 16 February 2016. In response to the granting of these approvals, Management Plans for the Bowditch and Goulburn River BA's have been prepared to satisfy the Commonwealth approval EPBC2009/5081 and the NSW consent (SSD-6464), replacing the ROMP. On 10 October 2016 HVO was granted approval (EPBC2016/7604), The Condon View BA provides 168ha of suitable direct offset to be compliant with this approval. Management Plans have also been prepared and submitted for the regional BAs: Seven Oaks, Putty, Condon View and North Rothbury.

The Biodiversity Offset Portal contains all the supporting documentation for this report, including photo point monitoring. Access to the portal is restricted, relevant regulators have been provided with login details; please contact Mount Thorley Warkworth should you require assistance.

2 LOCATION AND LANDHOLDER DETAILS

The locations of the regional BAs are shown in **Figure 1**, further details are provided in **Table 1**. The land is owned by Warkworth Mining Limited (WML). The Goulburn River BA is owned by Warkworth Mining Limited and has a portion of the total area designated as an offset for Hunter Valley Operations (HVO). Details of the Warkworth and HVO Offset areas are in **Table 2 and Figure 1 and 2**.

Table 1 Regional Biodiversity Areas

Biodiversity Area	Local Government Area	Land Owner	Area (ha)	Offset Area (ha)	Location
Goulburn River	Upper Hunter / Mid-Western	Warkworth Mining Limited	1,539	1,206	'The Rivers' 30km west of Merriwa, via Dulhunty Road, Comialla Road and Golden Hwy.
Bowditch	Muswellbrook	Warkworth Mining Limited	607	602	3km north of Sandy Hollow, 3450 Wybong Road, via Golden Hwy.
Seven Oaks	Mid-Western	Warkworth Mining Limited	521	519	35km west of Merriwa via Ulan Road, Summer Hill Road, Durridgerie Road and Smedes Road.
Condon View	Singleton	Warkworth Mining Limited	445	345	5km west of Putty via Box Tree Clearing Trail off Putty Valley Road.
Putty	Singleton	Warkworth Mining Limited	386	383	5km south of Putty via Box Gap Road.
North Rothbury	Cessnock	Warkworth Mining Limited	41	41	1km south of North Rothbury via Wine Country Drive.

Table 2 Goulburn River Biodiversity Area

Biodiversity Area	Land Owner	Area (ha)	Warkworth Offset Area (ha)	HVO Offset Area (ha)
Goulburn River	Warkworth Mining Limited	1,539	1,066	140

Location of the Warkworth Mining Limited Biodiversity Areas

Annual Compliance Report

Figure 1

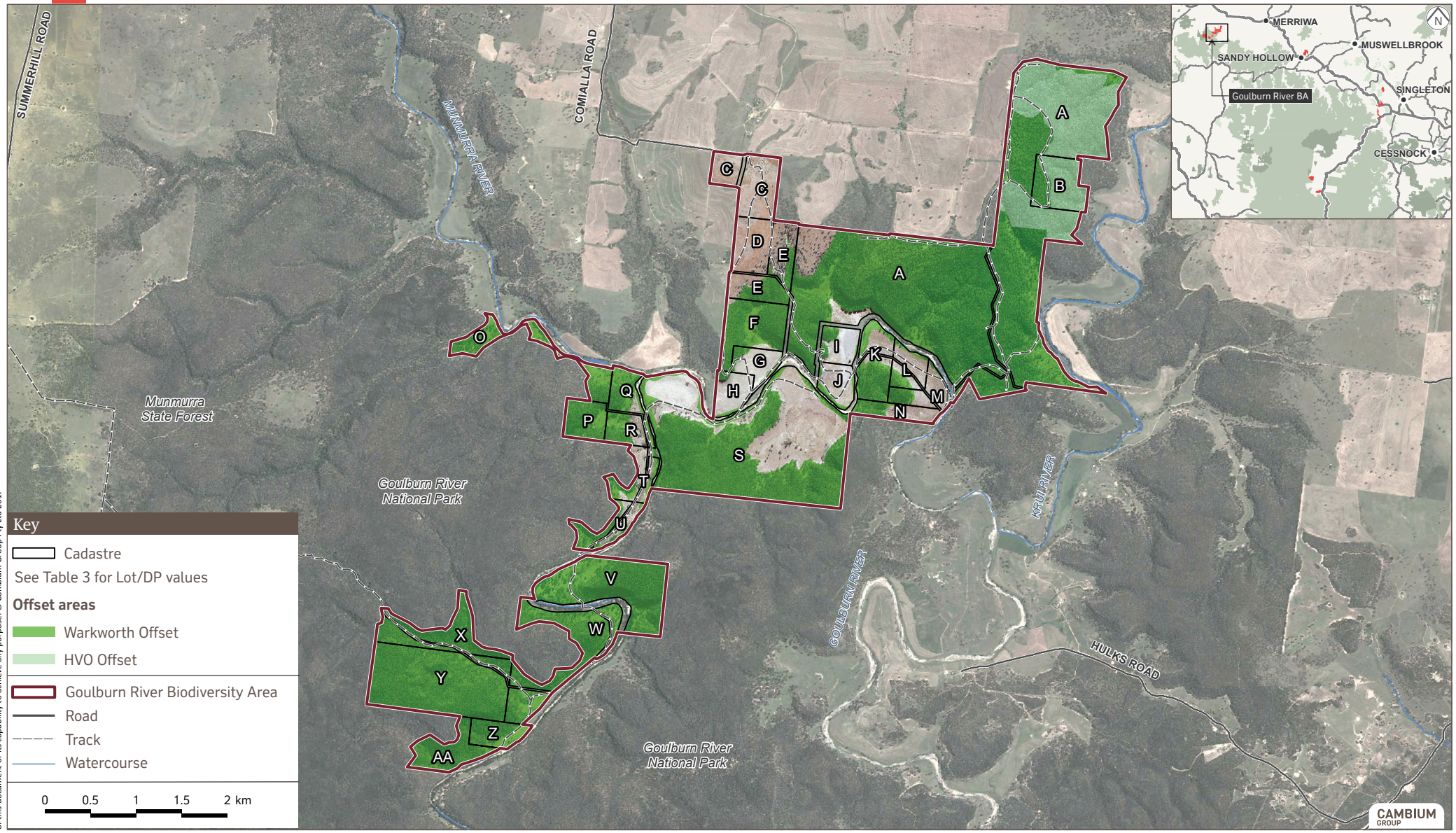


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Cadastral boundaries and offset areas at the Goulburn River Biodiversity Area

Management Plan 2022

Figure 2



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3 SUMMARY OF ACTIVITIES – 2024

Table 3 provides a summary of the activities undertaken during the reporting period (Year 8) and the progress in attaining the Performance Criteria for the key Conservation Management Strategies in the management plans.

3.1 Summary of climatic conditions

Figure 4 shows the monthly actual rainfall in 2024 compared to the long-term average for the regional Biodiversity Areas for the reporting period. The Putty region received 638mm which was 98mm below the long-term average. North Rothbury received 704mm, 32mm below the long-term average. Sandy Hollow received 669mm which was 74mm above the long-term average and the Merriwa region received 738mm, 140mm above the long-term average.

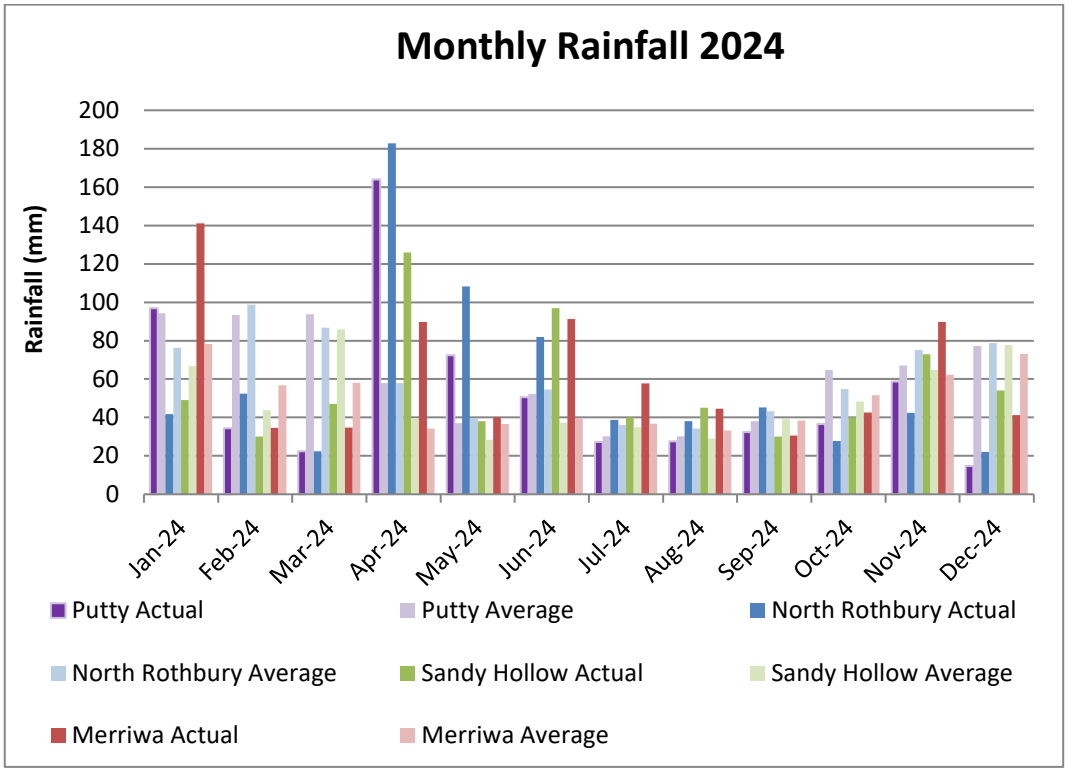


FIGURE 4 MONTHLY RAINFALL - 2024

Table 3 Summary of progress against Performance Criteria

Conservation Actions	Year 1 to Year 4	Year 5 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
ACTIVE RESTORATION				
Goulburn River BA Yellow Box – Grey Box – Red Gum grassy woodland (21.5ha) and River Oak riparian woodland (24.2ha)				
Performance Criteria	*Collection of seed. Plant propagation. Tubestock planted.* *Completed survival assessment.*		*Planting achieves above 70% survival.*	
Activity / Progress	Seed collection was undertaken at the Goulburn River BA in 2021. In 2019 17,000 tube stock was planted into 21.5ha of Yellow Box-Red Gum grassy woodland and 24.2ha of River Oak riparian woodland. The site preparation for these sites included ripping by dozer and weed control. To mimic nature the tree species were planted at a spacing of 5 -30m. All plants were watered, fertilised and protected with a tree guard. In 2020 maintenance of planting areas was undertaken and included infill planting of 12,000 tubestock. Survival assessments undertaken.	In 2021 maintenance of planting areas was undertaken and included infill planting of 12,000 tubestock into areas that could be accessed. In 2022 planting of 10,000 tube stock was delayed due access issues crossing the Goulburn River. In 2023 maintenance of planting areas was undertaken and included infill planting of 10,000 tubestock into areas that could be accessed. In 2024 maintenance of planting areas was undertaken.		Propagate plants. Undertake infill planting of Yellow Box – Grey Box – Red Gum grassy woodland and River Oak riparian woodland tubestock species. Undertake survival assessments.
All Regional BA's				
Performance Criteria	*Review monitoring data to identify areas that require re-planting.* *If re-planting is identified, develop a re-establishment plan and implement within 12 months*			
Activity / Progress	Ecological monitoring results have identified infill planting requirements in the River Oak riparian areas of the Goulburn River BA and Cassinia/Acacia regenerating Shrubland/Woodland of the Seven Oaks BA. Infill planting in these areas is scheduled for 2025.			

Conservation Actions	Year 1 to Year 4	Year 5 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
PASSIVE RESTORATION				
Weed control and monitoring				
Performance Criteria	*At least two weed control events each year for species listed in Table 14 of Management Plans and other weeds recorded from monitoring activities.* *Complete Ecological Monitoring, Rapid Condition Assessments and Property Inspections.*	*At least one weed control event each year for species listed in Table 14 of Management Plans and other weeds recorded from monitoring activities.* *Complete Ecological Monitoring, Rapid Condition Assessments and Property Inspections.*	*Ecological monitoring data indicates a trajectory for reduction in exotic plant cover over three consecutive assessments.*	
Activity / Progress		Weed contractor engaged to undertake weed control activities across all Regional BAs throughout the year to control noxious species and stop weeds spreading into previously un-infested areas. In 2024 weed control targeted the following species: African boxthorn (*Lycium ferocissimum*), African lovegrass *(Eragrostis curvulva),* African olive *(Olea europaea),* Blackberry *(Rubus fruticosus),* Blue heliotrope *(Heliotropium amplexicaule),* Bridal creeper *(Asparagus asparagoides),* Cadaghi *(Corymbia torelliana),* Castor oil *(Ricinus communis),* Cats claw creeper *(Dolichandra unguis-cati),* Common ragwort *(Senecio jacobaea),* Cootamundra Wattle *(Acacia baileyana),* Creeping pear *(Opuntia humifusa),* Fireweed *(Scenecio madagascariensis),* Green cestrum *(Cestrum parqui),* Grevillea *(Grevillea robusta),* Jacaranda *(Jacaranda mimosifolia),* Lantana *(Lantana camara),* Narrow-leaf cotton bush *(Gomphocarpus fruticosus),* Paterson's curse *(Echium plantagineum),* Prickly pear *(Opuntia stricta),* Queensland Wattle *(Acacia podalyriifolia),* Robinia *(Robinia pseudoacacia),* St John's wort *(Hypericum perforatum),* Sticky nightshade *(Solanum sisymbriifolium),* Trad *(Tradescantia fluminensis),* Tree of heaven *(Ailanthus altissima),* Whiskey grass *(Andropogon virginicus),* Willows *(Salix sp.),* Yucca *(Yucca aloifolia).* Rapid Condition Assessments, Property Inspections and Ecological Monitoring were completed in 2024.		Control noxious species and stop weeds spreading into previously un-infested areas. Undertake Rapid Condition Assessments. Undertake Property Inspections.

Conservation Actions	Year 1 to Year 4	Year 5 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
Pest control and monitoring				
Performance Criteria	*At least two control events each year for species listed in Management Plans, and any other species recorded from monitoring activities.* *All actions recorded in the Annual Report.* *Active participation in programme coordinated by Hunter Local Land Service (HLLS), this may include local control actions.* *Complete Rapid Condition Assessments and Property Inspections.*	*At least one control event each year for species listed in Management Plans, and any other species recorded from monitoring activities.* *All actions recorded in the Annual Report.* *Active participation in programme coordinated by HLLS, this may include local control actions.* *Complete Rapid Condition Assessments and Property Inspections.*	*No observed vertebrate pest or damage.* *Ecological monitoring demonstrates a trajectory to benchmark values for all attributes measured over three consecutive assessments (the average of all plots).*	
Activity / Progress		In 2024 vertebrate pest contractors were engaged to undertake programmes across all Regional BAs. Two 1080 ground baiting programmes targeting wild dogs and foxes were undertaken in autumn and spring in conjunction with neighbouring landholders and HLLS. A ground shooting program was undertaken at the Goulburn River BA in March controlling two cats, one fox, two rabbits and one hare. A ground shooting program was undertaken at the Seven Oaks BA in March controlling 20 rabbits, one feral pig, one fox and two feral cats. Noisy Miner ground shoots were undertaken at the Goulburn River and the Bowditch BA in July and August under a Licence to Harm Protected Animals (Biodiversity Conservation Act 2016). The programmes aim to assist the survivability of the Regent Honeyeater. The Goulburn River BA programme which is in its eighth consecutive year resulted in the control of 303 Noisy Miners over seven days. The Bowditch BA programme resulted in the control of 55 Noisy Miners over four days. This is the third Noisy Miner programme undertaken on this offset and will continue in 2025. Aerial shoots conducted by NPWS at the Goulburn River and Seven Oaks BA's in April and September controlled 15 feral pigs. Rapid Condition Assessments, Property Inspections and Ecological Monitoring were completed in 2024.		Participate in HLLS and NPWS Aerial Baiting/shooting programmes. Undertake shooting and baiting programmes. Undertake a control programme for Noisy Miners in the Regent Honeyeater breeding area at GRBA. Undertake Rapid Condition Assessments. Undertake Property Inspections.

Conservation Actions	Year 1 to Year 4	Year 5 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
Grazing				
Performance Criteria	*Grazing is conducted in accordance with the Management Plan.* *Boundary fences maintained.* *Complete Rapid Condition Assessment and Property Inspections.*			
Activity / Progress	No strategic grazing implemented on BAs in 2024. Rapid Condition Assessment and Property Inspections were completed in 2024. Boundary fences repaired at North Rothbury and Goulburn River BAs in 2024.			Undertake Rapid Condition Assessments. Undertake Property Inspections. Maintenance of boundary fences.
Regional BA Bushfire Management Plan (BFMP) and monitoring				
Performance Criteria	*Actions implemented.* *Review and revise if required.* *Complete Rapid Condition Assessments and Property Inspections*	*Actions implemented.* *Review and revise if required.* *Complete Rapid Condition Assessments and Property Inspections.* *Completed ecological fire management plan.*	*All required actions of BFMP have been implemented.* *BFMP has been reviewed annually and revised if required.*	
Activity / Progress		BFMP reviewed. Fuel load assessments were undertaken on Putty, Condon View, North Rothbury, Seven Oaks, Goulburn River and Bowditch BAs in 2024. A hazard reduction burn for the Seven Oaks BA was undertaken in May 2023, which treated approximately 90 Ha and reducing the fuel load to low. A Hazard Reduction Burn for North Rothbury BA was approved however conditions were outside the prescribed limits, so the burn was rescheduled for 2025. Slashing of fire breaks was undertaken at North Rothbury and Goulburn River BAs. Rapid Condition Assessments, Property Inspections and Ecological monitoring were completed in 2024.		Review BFMP. Implement a bushfire fuel hazard reduction programme. Undertake annual fuel load assessments on all Regional BAs. Undertake the Hazard Reduction Burn at North Rothbury BA. Undertake Rapid Condition Assessments. Undertake Property Inspections.

Conservation Actions	Year 1 to Year 4	Year 5 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
Erosion monitoring inspections and reports				
Performance Criteria	*Complete Rapid Condition Assessment and Property Inspections*			
Activity / Progress	Erosion areas inspected/monitored at North Rothbury, Bowditch, Goulburn River and Condon View BA's. Rapid Condition Assessment and Property Inspections were completed in 2024.			Undertake Rapid Condition Assessment. Undertake Property Inspections. Inspect/monitor erosion areas identified at North Rothbury, Goulburn River and Condon View BA's. Repair erosion area at Bowditch BA.
Dam conversion and rehabilitation and monitoring				
Performance Criteria	*Prepare dam conversion plan.* *Dam conversion complete and rehabilitation has stabilised the site.* Property inspections.	*Observed natural flow regime and no erosion.* *Property inspections.*	*All works completed.*	
Activity / Progress		Property inspections undertaken in 2024. A dam conversion plan was prepared in 2021.		Implement the dam conversion plan. Undertake Property Inspections.
Natural Regeneration and monitoring				
Performance Criteria	*Annual weed control, vertebrate pest and fire management actions implemented as per management plans.* *Complete Rapid Condition Assessment and Property Inspections.*		*Ecological monitoring demonstrates a trajectory to benchmark values for all attributes measured over three consecutive assessments (the average of all plots).*	
Activity / Progress	Rapid Condition Assessment, Ecological Monitoring and Property Inspections undertaken in 2024. Actions implemented as per management plans – see above.			Implement actions as per Management plans. Undertake Rapid Condition Assessment. Undertake Property Inspections.

Conservation Actions	Year 1 to Year 4	Year 5 to Year 10 (2024 is Year 8)	Completion Criteria	Actions 2025
Controlled Activities				
Performance Criteria	*No reported incidents of prohibited actions undertaken by Yancoal, contractors, consultants or other agents of Yancoal.* *Any clearing of vegetation reported in Annual Report.* *Signage and locks (where required) maintained.* *Complete risk assessment for any recreation activities.* *All occupants of residents compliant with requirements of the MP.* *No Cultural Heritage sites knowingly disturbed and any protective barricading maintained.* *Damaged and unwanted fences removed.* *All Property Inspections completed.*			
Activity / Progress	No reported incidents of prohibited actions undertaken in 2024. There was one reported incident at North Rothbury BA in 2024, which involved unauthorised access by a neighbouring resident. The resident realigned a section of the boundary fence and also used a small excavator to push up ground cover in the area. The neighbour was provided with a letter advising that no future unauthorised access was permitted and if any actions were deemed required, that these needed to be communicated to Yancoal MTW for follow up as required. The boundary fence was repaired and reinstated along its correct alignment. Cultural Heritage sites are barricaded. Signage and locks maintained. Regular property inspections were undertaken in 2024.			Undertake Property Inspections. Repair Cultural Heritage barricading where required.

4 MONITORING ACTIVITIES

The following table provides a summary of the monitoring activities undertaken as detailed in the management plans. Monitoring reports and results are available on the Biodiversity Offset Portal.

Table 4 Monitoring Activity Summary

Monitoring	2024	Date/s	Completed by
Bird Assemblage	X	July – November 2024, next due July – October 2026	Future Fauna
Habitat Restoration	X	September – November 2024, next due September – November 2026	Mosaic Ecology and Leaf ERC
Rapid Condition Assessment	X	August/September/November 2024 next due September – November 2025	Franks Fencing (Land Management Advisor)
Property Inspection	X	Mar/April/October/November 2024, next due April/November 2025	Mosaic Ecology

4.1 Bird assemblages monitoring

Bird assemblage monitoring is undertaken every two years as part of the ecological monitoring requirements to assess changes in the condition and extent of the woodland habitats within the BAs and the ongoing usage of these habitats by woodland birds, including the critically endangered regent honeyeater and swift parrot.

Previous bird monitoring methodology (2014 – 2018) included two-hectare, 20-minute area searches with one visit to each monitoring site during winter and early spring. In 2020 the bird monitoring methodology changed to increase site visits so that each site was visited three times between July and October, to cover the period when swift parrots and regent honeyeaters are most likely to be present. The maximum count of all bird species detected visually or audibly during the survey period and within the boundaries of each survey site were recorded. Data from the 2020 monitoring program demonstrated that three visits to each monitoring site is sufficient to record most bird species regularly occupying the monitoring sites. In 2022 eighteen new monitoring sites were added to the monitoring programme to help increase the likelihood of detecting regent honeyeaters or swift parrots occupying the BAs.

A total 120 species of birds were recorded throughout the eight Biodiversity Areas in 2024 representing an increase of seven species compared to 2022 data. A total of 10 threatened bird species were detected during surveys. Relative to 2022, total species richness increased slightly at all Biodiversity Areas except Condon View. Bird abundance measures were more mixed, with slight increases at Putty, Southern BA and Condon View, slight decreases at North Rothbury and Northern BA and little change at the other three Biodiversity Areas. None of the changes in bird species richness or abundance within Biodiversity Areas were statistically significant relative to 2022. Turquoise parrots colonised the Goulburn River Biodiversity Area for the first time since monitoring commenced in 2014.

A Regent honeyeater was located for the first time on Condon View. This was a zoo-bred bird released in the lower Hunter Valley six weeks prior. Between six and ten Regent honeyeaters were detected on the Goulburn River BA, where two pairs nested. Regent honeyeaters were recorded in two new areas of the property. No Swift parrots were detected occupying the Biodiversity Areas in 2024.

The following are the recommendations and discussion summaries for the Regional Biodiversity Areas.

Seven Oaks BA

After three visits, a total of 67 bird species were detected during standardised surveys, representing a recovery to the 2020 diversity levels after a decrease in 2022. Bird species richness dropped slightly in 2024 at Seven Oaks based on one visit to each monitoring site, though species richness measures based on three visits have remained stable since 2020. There was a slight decrease in bird abundance at Seven Oaks in 2024 relative to 2020.

Three threatened species were detected during standardised surveys: Speckled warbler, Varied sittella and Hooded robin. Two Glossy black cockatoos were heard opportunistically outside of the monitoring sites on dusk. Hooded robin numbers remain healthy on Seven Oaks, despite evidence of significant declines in this species in other strongholds (e.g. Capertee Valley) in recent years (R. Crates, Pers. Obs). The South-eastern hooded robin has been uplisted to endangered under the EPBC Act (DCCEEW 2023). Hooded robins tend to prefer more open and less heavily-timbered areas at Seven Oaks, so future habitat restoration planned for Seven Oaks should consider leaving some more open areas where the Hooded robins occur.

As for the other Biodiversity Areas, there was again very little eucalypt and mistletoe blossom on Seven Oaks in 2024, but there was again less evidence of feral pigs on the property than in 2020. Feral cats were heard during the survey period. There was evidence of an increase in the local Noisy miner population. At this stage, Noisy miner management is not considered necessary at Seven Oaks, although the situation should be monitored for continued increases in the Noisy miner population in the near future.

Management recommendations include:

- Small-scale restoration plantings of Regent honeyeater feed trees
- Continue pest management of pest species, including feral pigs and cats
- Consider leaving some open areas to maintain suitable habitat for the local population of Hooded robins.

Goulburn River BA

After three visits, a total of 89 bird species were detected during standardised surveys representing an increase of 18 and 11 species on the 2020 and 2022 data, respectively. Seven threated species were detected: Regent honeyeater, Speckled warbler, Brown treecreeper, Varied sittella, Dusky woodswallow, Little lorikeet and Turquoise parrot. Surprisingly, 2024 is the first year that Turquoise parrots have occupied with GRBA since monitoring commenced in 2015 (R.Crates, Pers.Obs). A pair of birds occupied the downstream end of Thompson's Flat and may well have bred close to this location. 2024 also saw high numbers of Emu's occupying the Goulburn River BA. Groups included many juveniles, suggesting 2023 was an excellent breeding season for this species in the area.

Nectar resources were more abundant in spring on the Goulburn River. White box generally did not flower in winter however it was a good year for yellow box. Flowering yellow box is the primary reason why regent honeyeaters returned to the GRBA in relatively good numbers in 2024. Needle-leaf mistletoe was flowering lightly in many sections of the river and appears to have continued to recover from mass mortality during the 2019/20 drought. It is also noted that its host species Casuarina

cunninghamiana has suffered mortality along some sections of the Goulburn River. Some areas of yellow box also appear to be in increasingly poor health.

Ongoing Noisy miner management continues to suppress Noisy miner numbers on the Goulburn River, though small numbers of miners remain. No noisy miners were detected occupying known regent honeyeater breeding areas within the property.

Evidence of feral pig activity along the Goulburn River was markedly lower than in previous years, although there has been an observed increase in the number of ground-based weeds on the GRBA. This may be impacting the suitability of the GRBA for ground-welling bird species such as Red-browed finch, Double-barred finch and Diamond firetail.

Management recommendations include:

- Consider increasing weed management efforts on the river flats.
- Continue/increase tree guard collection.
- Replant the riparian zone and broader river flats as suggested in the recent statement of advice provided by Future Fauna and Mosaic Ecology (Crates 2024; Moen 2024).
- Continue management of feral pigs, cats and Noisy miners.
- Consider revising the plan of management to permit Regent honeyeater nest protection efforts. Monitoring has shown that most regent honeyeater nests fail due to a range of native avian and mammalian species. Targeted management of these species with the vicinity of active Regent honeyeater nests has been effective at boosting the success rate of nests in Capertee National Park recently (Crates et al. 2024).

Putty

The only eucalypt blossom at Putty in 2024 occurred in the gums lining the Putty Creek. No stringybark or ironbark flowered at Putty in 2024. After three visits, a total of 62 bird species were detected during standardised surveys, representing an increase of 6 species on 2022 surveys. After one visit, the 33 species detected was lower than all previous years' data. Indeed, bird activity at Putty was unusually low early in the season, although as the data shows, activity increased later in spring.

Four threatened species were detected on Putty in 2020: Little lorikeet, Speckled warbler, Varied sittella and Grey-crowned babbler. Glossy black cockatoos and Barking owls were also both heard opportunistically within the site, outside of standardised surveys.

Noisy miner numbers were again generally low on Putty and again there was minimal visible evidence of feral / pest species presence on the property, except for a large deer stag (probable red deer) encountered on one visit.

Management recommendations include:

- Consider small scale restoration plantings of Regent honeyeater feed trees on cleared flats.
- Continue pest management.

Condon View

After three visits, a total of 58 bird species were detected during standardised surveys; an increase of three species on 2022 data. After one visit, the 34 species detected on surveys represented an increase on 2020 data but a decrease on the 2022 data. As was the case for neighbouring Putty, bird activity in the late winter/early spring period was low at Condon View, thought it increased as the spring progressed.

Seven threatened species were present on Condon View in 2022: Little lorikeet, Grey-crowned babbler, Varied sittella, Dusky woodswallow, Gang-gang cockatoo, Speckled warbler and Regent honeyeater. This is the first time Regent honeyeater has been detected on Condon View. Seven species represents two more threatened species detected on the property than in 2018 and 2020, and one more than in 2022. No Hooded robins were detected at Condon View again this year, suggesting the species may well have gone locally extinct at this location.

There was minimal evidence of feral species impact on Condon View, though domestic cows were again observed within the Biodiversity Area. In positive news, the health of some of the gum species on the lower slopes and flats that had deteriorated between 2020 and 2022 is showing signs of improvement.

Management recommendations include:

- Continue pest management
- Ensure cows are excluded.

North Rothbury

Twenty-five species were detected at monitoring sites after a single survey, which represents a decrease of three species on the 2022 data. As in 2020 and 2022, there was no blossom in spotted gum and broad-leaved ironbark in winter/spring. Noisy miner numbers remain high in the eastern section of the property, where there is some evidence of a decline in the health of spotted gum and broad-leaved ironbark. The abundance of small forest birds is markedly higher in the western side of the property, which does not form part of the Noisy miner colony. Two threatened species were detected on North Rothbury: Grey-crowned babbler and Varied sittella. No Speckled warblers were detected in 2024, as they were in 2022. There was minimal evidence of impacts of feral species on the property this spring.

Management recommendations include:

- Noisy miner management through understorey and mid-storey regeneration.

Bowditch

After three visits, a total of 58 bird species were detected during standardised surveys, representing an increase of six species on the 2022 data. After one visit, the 42 species detected on surveys remained the same as for 2020 and 2022. Woodland bird abundance at Bowditch was similar in 2024 to 2022, though it important to note that Noisy miner numbers have declined markedly on the property since 2022 surveys, and therefore for bird abundance to remain stable suggests Noisy miners have been replaced by other species. Three threatened species were detected on Bowditch in 2024: Speckled warbler, Grey-crowned babbler and Varied sittella.

No deer, no cattle and no other feral species were observed occupying Bowditch during bird surveys and Noisy miner management appears to have suppressed the local population effectively.

Management recommendations include:

- Small-scale restoration plantings of Regent honeyeater feed trees.
- Continue pest management, such as deer and Noisy miners

4.2 Habitat restoration monitoring

This habitat restoration study completes the sixth monitoring event and fifth post

baseline for Goulburn River and Bowditch BAs and fourth post baseline for all the other Regional BAs. The habitat restoration monitoring programme assesses the changes in key attributes within the BA through time as grassland communities are restored to woodland. Monitoring was undertaken across all BAs in Spring 2024.

The following are the recommendations and discussion summaries for the Regional Biodiversity Areas.

Seven Oaks BA
2024 monitoring results indicate that vegetation is regenerating naturally in some plots and not in others. Canopy cover is generally low across the regenerating woodland but should improve naturally in higher resilience areas. Mid-storey cover is low at some plots, likely corresponding to the mulching of Sifton Bush in previous years and the burn caried out in 2023. Mid-storey cover should improve over time but planting in the low-resilience areas will be required. Native plant species richness was highest in the ground layer. Fallen logs and tree hollow scores are also low.

Management recommendations include:

- Planting of canopy and mid-storey species in areas identified as having lower resilience
- Weed control targeting priority weeds
- Pest management for feral pigs and rabbits.

Goulburn River BA
The remnant woodland and grassland vegetation at the Goulburn River BA is generally stable but in variable condition.

Data from Yellow Box – Grey Box – Red Gum grassy woodland monitoring plots shows that the vegetation is stable, with all sites achieving the Benchmark range for Canopy cover. Native species richness was well above the Benchmark minimum for all plots. 132 native species were recorded across all plots, representing 40 families. The native mid storey and ground layer shrub scores are low throughout, while ground layer grasses and other categories are within the Benchmark range or higher than the Benchmark maximum. Exotic cover is very low except for monitoring plot H1. Logs on the ground and tree hollows were above Benchmark for most plots and the 2024 mean for these two attributes was above the Benchmark minimum.
Data from Slaty Gum - Grey Box shrubby woodland monitoring plots shows that the vegetation has high species richness and good overstorey cover. Ground layer - grasses cover was above the Benchmark maximum and the other types of ground cover were lower than Benchmark. Logs on the ground was below Benchmark but tree hollows were above the Benchmark minimum.
Data from the River Oak riparian grassy tall woodland monitoring plots shows that this vegetation type is in poor condition. Canopy cover is present at both plots, although it is very variable across the transect due to previous clearing. The remnant trees are restricted to the river bench and all vegetation is cleared from the high bank. Planting has occurred but the young trees so far are not contributing to canopy cover. Native diversity is low in this vegetation type as is mid storey and ground layer cover. Native grasses dominate the ground layer. Exotic cover is medium to high but mostly composed of low-priority annual species
The grassland data shows that the derived grassland is dominated by native grasses but that exotic cover is still high. Native species richness is lower than the woodland minimum and no mid-storey or over-storey is present.

Management recommendations include:

- Consider planting or seeding of native understorey, mid-storey and canopy species to assist sites to achieve Benchmark values.
- Weed control targeting priority weeds.

Bowditch BA

2024 monitoring results indicate that the woodland vegetation is generally stable and will continue to recover from past disturbance with some management intervention.
The Narrow Leaved Ironbark Woodland exceeds the Benchmark minimum for all except Native Ground stratum shrubs and fallen log length. Selected canopy planting may be necessary if canopy recruitment does not improve over time.
The Redgum Rough Barked Apple Woodland has two plots with mean values meeting or exceeding Benchmark values for all attributes except Ground stratum shrubs, number of hollows and/or Fallen Logs. One plot (H1) showed signs of inundation by water resulting in a significant difference in the ground layer and mid storey failing to match several Benchmark ranges. Previous years data for this plot show similar results. It is possible that the hydrology of this site means the vegetation doesn't conform to this woodland and it will never meet the Benchmark Range.

Management recommendations include:

- Establish a replacement monitoring plot for H1
- Weed control targeting priority weeds.
- A limited planting program to improve canopy cover and shrub diversity

Putty BA

2024 monitoring results indicate that the vegetation is generally stable and will continue to recover from past disturbance with some management intervention.
The data from plots in regenerating forest shows that the vegetation is not meeting the Benchmark scores for some attributes. A total of 78 native plant species representing 33 families was recorded at all monitoring plots. However, native species richness is below the Benchmark minimum for all plots. Mean native vegetation cover is low in the overstorey, midstorey, ground layer grasses and ground layer other attributes. Fallen logs and tree hollows were also generally lower than Benchmark.
Plot H5 is located in a drainage depression and vegetation here can be characterised as native sedgeland.

Management recommendations include:

- Increasing habitat quality by installing nest boxes and placing logs on the ground.
- Consider planting native herbs and shrub layer cover and diversity in areas where cover is low and to increase landscape connectivity and habitat for threatened species.
- Weed control targeting priority weeds.
- Establish a replacement monitoring plot for H5

Condon View BA

2024 monitoring results indicate the woodland remnants are recovering from past disturbance.
Woodland site data shows that the vegetation is stable, with a generally low Overstorey and Mid storey cover but good ground cover. The ground cover is concentrated in the grasses category. Native species richness is good, being above Benchmark minimum on average. A total of 82 native species representing 31 Families were recorded across the

five plots. Exotic species diversity and cover are low. Habitat quality is variable but a significant amount of fallen timber is present and tree hollows are above Benchmark.

Management recommendations include:

- Consider planting understorey species where cover is low and to increase landscape connectivity and habitat for threatened species.
- Weed control targeting priority weeds.
- Exclude cattle from biodiversity area

North Rothbury BA

The 2024 monitoring results show that the vegetation has achieved many of the Benchmark attributes or is trending towards them.

Data from the Red Ironbark – Spotted Gum shrubby woodland monitoring plots shows that the vegetation has good floristic diversity and structural complexity, with all mean attributes above Benchmark except for number of tree hollows. The vegetation in North Rothbury plots supported 108 native plant species representing 33 families.

Although some priority weeds were recorded, total exotic plant cover was very low and the majority of exotic cover was represented by non-priority exotic species.

Data from the Forest Red Gum – Grey Box grassy woodland monitoring plots shows that the vegetation has excellent floristic diversity compared to Benchmark values and that all Benchmark values are met for the percentage cover attributes in all three plots. Fallen logs and tree hollow numbers are below Benchmark. A range of priority weeds were recorded, including in the ground layer and midstorey. Total exotic plant cover was very low and the majority of exotic cover was represented by non-priority exotic species.

Management recommendations include:

- Weed control targeting priority weeds.
- Consider increasing habitat quality by installing nest boxes and placing logs on the ground.
- Move access tracks away from monitoring plots

5 PROGRESS IN ATTAINING CONSERVATION OBJECTIVES AGAINST KEY PERFORMANCE INDICATORS

The primary conservation objectives for the Regional BAs are to:

- enhance landscape connectivity within the surrounding landscape;
- improve fauna movement and flora dispersal opportunities within the surrounding landscape;
- increased condition and area of suitable habitats for threatened fauna species within protected reserves, specifically for the Regent Honeyeater and Swift Parrot;
- provide refuge and habitat for local fauna populations and transient species, particularly threatened species; and
- enhance network of protected vegetation within the Hunter Valley.

Table 3 details the progress in attainment of the long-term conservation objectives. The baseline data presented is from the first monitoring completed in 2014. The Rapid

Condition Assessment (RCA) monitoring results indicate that the vegetation and habitat health is being maintained in comparison to the baseline data **Table 5 – Table 10**.

6 ADAPTIVE MANAGEMENT

No new environmental risks have been identified during the reporting period.

Table 5 Goulburn River BA: Biodiversity Values and KPIs

Biodiversity Value	Nested Conservation Value(s)	Description and baseline metric	KPI	Progress comment
Woodland (MZ2, MZ3, MZ4, MZ5 and MZ7)		Total area: 1,169ha RCA Average Health rating 17.6/20	Maintain or increase area, connectivity and habitat condition over 10 years	RCA Average health rating 2015 – 17/20 2016 – 17.1/20
	Fauna Habitat	Moderate potential habitat for Swift Parrot and Regent Honeyeater	improved habitat condition over 10 years	2017 – 17.1/20 2018 - 18.1/20 2019 – 18.4/20 2020 - *17.5/20 2021 - *17.4/20 2022 - *18.2/20 2023 – 17.8/20 2024 – 17.4/20 Area and health maintained *Some sites were inaccessible due to high water levels in the Goulburn River.

Table 6 Bowditch BA: Biodiversity Values and KPIs

Biodiversity Value	Nested Conservation Value(s)	Description and baseline metric	KPI	Progress comment
Woodland (MZ1, MZ2 and MZ4)		Total area: 602ha RCA Average Health rating 18.1/20	Observed and measured increase or maintained RCA scores over 10 years	RCA Average Health rating 2015 – 18/20 2016 – 18.4/20
	Fauna Habitat	Moderate potential habitat for Swift Parrot and Regent Honeyeater	Maintain or increase the condition and extent of habitat and bird usage over 10 years	2017 – 17.1/20 2018 – 17.7/20 2019 – 17.7/20 2020 – 18.1/20 2021 – 18.3/20 2022 – 18.7/20 2023 – 18.3/20 2024 – 18.8/20 Area and health maintained

Table 7 Seven Oaks BA: Biodiversity Values and KPIs

Biodiversity Value	Nested Conservation Value(s)	Description and baseline metric	KPI	Progress comment
Woodland (MZ3, MZ4 and MZ5)		Total area: 519ha RCA Average Health rating 17.9/20	Observe an increase in area, connectivity and habitat condition over 10 years	RCA Average Health rating 2016 – 18/20 2017 – 17.3/20
	Fauna Habitat	Moderate potential habitat for Swift Parrot and Regent Honeyeater	Maintain or increase the condition and extent of habitat and bird usage over 10 years	2018 – 17.6/20 2019 – 17.6/20 2020 - 18.2/20 2021 – 18.2/20 2022 – 18.2/20 2023 – 18/20 2024 – 18.2/20 Area and health maintained

Table 8 Condon View BA: Biodiversity Values and KPIs

Biodiversity Value	Nested Conservation Value(s)	Description and baseline metric	KPI	Progress comment
Woodland (MZ2 and MZ4)		Total area: 515ha RCA Average Health rating 19.2/20	Maintain or increase area, connectivity and habitat condition over 10 years	RCA Average Health rating 2016 – 20/20 2017 – 18.2/20
	Fauna Habitat	Moderate potential habitat for Swift Parrot and Regent Honeyeater	Maintain or increase the condition and extent of habitat and bird usage over 10 years	2018 – 18.6/20 2019 – 18.6/20 2020 – 19/20 2021 – 19.3/20 2022 – 19.3/20 2023 – 19.7/20 2024 – 19.7/20 Area and health maintained

Table 9 Putty BA: Biodiversity Values and KPIs

Biodiversity Value	Nested Conservation Value(s)	Description and baseline metric	KPI	Progress comment
Woodland (MZ2, MZ3 and MZ4)		Total area: 383ha RCA Average Health rating 17.1/20	Observe an increase in area, connectivity and habitat condition over 10 years	RCA Average Health rating 2016 – 17.3/20 2017 – 17.6/20
	Fauna Habitat	Moderate potential habitat for Swift Parrot and Regent Honeyeater	Maintain or increase the condition and extent of habitat and bird usage over 10 years	2018 – 17.8/20 2019 – 15.6/20 2020 – 16.2/20 2021 – 16.8/20 2022 – 17/20 2023 – 17.3/20 2024 – 18/20 (Bushfire in July and December 2019 reduced the health rating)

Table 10 North Rothbury BA: Biodiversity Values and KPIs

Biodiversity Value	Nested Conservation Value(s)	Description and baseline metric	KPI	Progress comment
Woodland (MZ1 and MZ2)		Total area: 41ha RCA Average Health rating 18.7/20	Observe an increase in area, connectivity and habitat condition over 10 years	RCA Average Health rating 2016 – 18/20 2017 – 18.2/20
	Fauna Habitat	Moderate potential habitat for Swift Parrot and Regent Honeyeater	Maintain or increase the condition and extent of habitat and bird usage over 10 years	2018 – 19/20 2019 – 18.7/20 2020 – 19/20 2021 – 19/20 2022 – 19/20 2023 – 18.75/20 2024 – 18.25/20 Area and health maintained

Appendix 9:

IEA Action Status Table

Mount Thorley Warkworth Complex (SSD-6464 and SSD-6465) – Independent Environmental Audit 2023 – Progress with Audit Recommendations

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
Ref	**Compliance Requirement**	**Independent Audit Finding**	**Independent Audit Recommendation**	**MTW Response / Progress**
SSD 6464				
S2 C9	By the end of January 2017, unless the Planning Secretary agrees otherwise, the Applicant must surrender the existing development consent (DA-300-9-2002-i) for the Warkworth mine in accordance with Section 104A of the EP&A Act. Following the commencement of development under this consent, the conditions of this consent shall prevail to the extent of any inconsistency with the conditions of DA-300-9-2002-i.	Reported as non-compliant in the 2020 Annual Review. No documentation was available to the auditor that confirmed that the existing consents had been surrendered.	Work with DPE is close out the surrender of the development consents.	This is noted in the audit report as an administrative non-compliance. An application to surrender the development consent DA 300-9-20020i was submitted in June 2017 and progressed with correspondence with DPHI up to 2021. This was not progressed in the 2024 Annual review Period. MTW will continue to work with DPHI to progress surrender of the relevant consent during the 2025 Annual Review period.
S3 C5	From 1 January 2017, except for the land in Table 1, the Applicant must ensure that the noise generated by the Development does not exceed the noise criteria in Table 3 at any residence on privately owned land.	Section 6.2.2/3 of each Annual Review presents the results of the noise monthly noise monitoring undertaken by independent consultants. A summary of compliance is as follows: 2020 – no non compliances reported 2021 - no non compliances reported 2022 – six exceedances of the noise criteria were recorded One hundred and fifty-seven (157) noise complaints were received during the audit period. This consisted of 98 complaints in 2020, 49 in 2021, 47 in 2022 and 11 in 2023 (to the end of April. The Auditor notes that that 112 of the 162 (69%) noise complaints were from five residents. While there has been an improvement over the life of the project in the number of complaints (325 recorded in 2016), a contributing factor to the higher number of complaints during the early operational stages may potentially be attributed to a higher proportion of activities closer to ground level, with improvements achieved over the project life due to attenuation provided by the pit depth, mine walls and in acoustic vehicle technology.	Review current predictive tools and processes against available models that are currently being utilised in both the mining and construction industries with the objective of: • Identifying areas on site that have the potential to impact noise sensitive receivers; • Provides a Noise Impact Prediction Model that can be used by MTW to plan works in those areas with the objective to proactively ensure that noise from plant and equipment does not cause annoyance to local community and exceed the relevant criteria.	Completed. MTW has an existing predictive noise enhancement tool to identify potential noise enhancement at the various directions surrounding the mine, and additionally already implements the rigorous planning, noise monitoring and management measures described in the Noise Management Plan. In response to the audit recommendation, MTW has reviewed two alternative predictive noise tools (models), and additionally a weather enhancement tool used at MTW that has initially been developed to predict blast overpressure enhancement, which progressed to have the capability for hourly updates on enhancement conditions in 2023, but has continued using existing prediction tools. During 2024, MTW implemented an improved noise monitoring method for supplementary noise monitoring which involves post processing of the measured noise spectrum to identify potential low frequency modifying factor. This new tool was developed in conjunction with an acoustic consultant during 2023-2024 as an improvement measure. Since implementation, operations are modified in response to the measured site only level, including any modifying factor.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
Ref	**Compliance Requirement**	**Independent Audit Finding**	**Independent Audit Recommendation**	**MTW Response / Progress**
		Prior to each shift, a predictive tool is utilised to assess potential impacts taking into account the prevailing meteorological conditions. MTW implements noise management and monitoring methods to identify if there is a potential issue and takes rectification action to modify operations where indicated. Following the receipt of noise complaints, a CRO is deployed to make observations and measure noise levels (5-minute sample). In many instances the CROs observations have verified the complaint and the noise readings have indicated that the noise levels from the mine were exceeding the relevant criteria. Where these potential exceedances are identified, MTW review the works being undertaken at the likely exceedance source and make changes to those works to reduce noise emissions. The Auditor understands that noise modelling of future works that may impact sensitive receivers is not routinely undertaken.		
S3 C19a and c	The Applicant must: a) implement all reasonable and feasible measures to minimise the: • odour, fume and dust emissions of the development; and • release of greenhouse gas emissions from the development; c) minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events (see note d to Tables 5-7 above);	Fifty-eight dust-related complaints were received during the audit period. No exceedances in dust criteria were reported during the audit period. Significant areas of the site have been cleared and progressive rehabilitation works are behind schedule. The Auditor also observed significant areas, that while not ready for final rehabilitation, would benefit from temporary stabilisation to help reduce dust emissions during adverse wind conditions.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets. Prepare and implement a program for the stabilisation of unsealed / disturbed areas of the site including stockpiles, finished landforms, and disturbed areas that are not currently being actively worked / filled). The program should identify and classify all areas of the site that are currently disturbed according to the dust generation potential of those areas and establish clear targets for the stabilisation of those areas (either permanent or temporary) with the objective of meeting the requirements of the Blue Book.	MTW notes that the audit found there were no exceedances in dust criteria reported during the audit period. MTW has a well developed and implemented Air Quality Management Plan and considers that reasonable and feasible controls are being implemented. In relation to rehabilitation progression, MTW acknowledges the benefit rehabilitation progress has for minimising air quality impacts, and undertakes progressive rehabilitation as part of normal mine operations. MTW completed 100.6 Ha of rehabilitation in 2024, which greater than the planned 81.2 Ha in the Forward Program for 2024. MTW submits an updated rehabilitation Forward Program, as required by the conditions of mining leases, to be submitted to the Resources Regulator by end of March each year, which identifies rehabilitation progression for the upcoming 3 years. Refer to SSD-6464 S3 C57 for rehabilitation progression response. The Air Quality Management Plan for MTW includes as a control measures to undertake interim stabilisation works. In addition to completed rehabilitation works, during 2024, MTW identified further areas for interim stabilisation, which resulted in stabilisation treatment works including: -aerial seeding of 151Ha in December 2024 to an exotic pasture grass and legume mix suitable for summer sowing. Fertiliser was mixed with the seed prior to loading to provide sufficient nutrients for plant growth.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
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S3 C24	Unless an EPL or the EPA authorises otherwise, the Applicant must ensure that all surface water discharges from the site comply with the: a) discharge limits (both volume and quality) set for the development in any EPL; and	The Annual Returns prepared for the Environment Protection Licence 1376 noted several non-compliances with this condition. Refer to audit schedule for EPL 1376 for details.	A risk assessment and review of the storage capacity of the retention dams be undertaken that takes into account the increasing risk of extreme weather events, including extended duration wet weather patterns.	Completed. MTW undertook a review and update of a risk assessment for all water storage dams at MTW in October 2023. This review included consideration of overtopping potential for the specific dams.
S3 C26 (Table 8)	Design, install and/or maintain mine water storage infrastructure to ensure no discharge of mine water off-site (except in accordance with condition 24) On-site storages (including mine infrastructure dams and treatment dams) are suitably designed, installed and/or maintained to minimise permeability Maintain adequate freeboard within the pit void at all times to minimise the risk of discharge to surface waters	This commitment is included in Table 5.1 of the WMP. There have been two incidents that resulted in the discharge of mine-water. The incident on 4/1/21 was from a water equipment park up area has spilled from a dam into a water course reporting into Wollombi Brook, the incident resulted penalty notices issued by both the DPE and EPA. In response to the Penalty notices, WML prepared an action plan which includes several actions relating to detailed engineering assessment, design and construction of civil infrastructure for improved surface water drainage infrastructure at WML North Pit North. Correspondence from DPE and WML confirms that the detailed design works for the North Pit North drainage improvements were completed in October 2021. The incident on 4/7/22 was reported as an overtopping event during a greater than design rainfall event. It was reported that samples were collected with no environmental harm caused. No further actions to prevent recurrence were proposed by WML.	In relation to the incident on the 4/7/21, no further actions are recommended over and above the actions taken by WML in response to the incident. In response to the incident on the 4/7/22, it is recommended that a risk assessment and review of the storage capacity of the retention dams be undertaken that takes into account the increasing risk of extreme weather events, including extended duration wet weather patterns.	Completed. Refer to response to SSD-6464 S3 C24.
S3 C28	Within 3 years of the date of commencement of development under this approval, the applicant will retire biodiversity credits of a class and number specified in Tables 9 and 10 below to the satisfaction of BCD.	DPE has yet to approve the retirement of biodiversity credits. However, it is acknowledged that some components such as the provision of supplementary measures (such as funding of research) have been met.	As the retirement of requisite credits is now over 4 years overdue, it is recommended that negotiations with the Department/BCD/BCT to reach an agreeable solution are given priority.	This is noted in the audit report as an administrative non-compliance. Warkworth Mining Ltd (WML) lodged a modification application for development consent SSD6464 (MOD1) in April 2021 to clarify biodiversity offset requirements for WML and to facilitate in-perpetuity conservation of biodiversity offset land. During 2024, WML has continued in dialogue with DPHI and BCS regarding this matter, and are progressing towards a

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
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				Biodiversity Stewardship Agreement (BSA) as this is the only mechanism acceptable to the NSW Government for in-perpetuity security of biodiversity offset land. During 2024, BCS completed an equivalence assessment associated with MTW's biodiversity offset land. With this step completed and in consultation with BCS, a BSA is intended to progress during 2025 for one offset area to develop the method for securing the BSA. After the individual offset BSA is completed and those credits retired, BSAs for each offset area will be progressed. The equivalent credit values established for each BSA will then be retired upon execution of the BSAs.
S3 C30	Within 3 years of the date of commencement of the development under this consent, the Applicant must secure offset areas listed in Table 12 under an in-perpetuity conservation mechanism such as entering into a biobank agreement, in accordance with the relevant provisions of the TSC Act. The direct land-based offsets may be used as offsets for any approval required under the EPBC Act for this development.	Date of commencement was 15 Feb 2016, therefore offset areas were to be secured under an in-perpetuity mechanism 14 February 2019 (i.e. within 3 years of commencement). Despite documentation/correspondence between WML, the Department and BCD since 2018, which has included submission of a modification application to DPE (SSD-6464 MOD1) to address securing of the offsets, this item remains incomplete. Actions are currently still being undertaken to reach an agreeable resolution with BCD and the department. However, no written correspondence between WML and the Department/BCD has been sited since the February 2022 correspondence.	As the securing of offset areas under an appropriate mechanism is now over 4 years overdue, it is recommended that negotiations with the Department/BCD/BCT to reach an agreeable solution are given priority.	This is noted in the audit report as an administrative non-compliance. Refer to response to SSD-6464 S3 C28.
S3 C34	Within 12 months of the commencement of the development under this consent, the Applicant must prepare an Integrated Management Plan for the Warkworth Sands Woodland EEC to the satisfaction of BCD. This plan must be prepared in consultation with the owners of Wambo and Bulga Mines and outline the measures that would be implemented to coordinate management and recovery efforts for the EEC.	Correspondence sighted confirmed that BCD had received the WSW IMP as submitted by WML. Correspondence from BCD confirmed that the review of the 2018 IMP was largely complete. However no subsequent correspondence sighted and no correspondence/documentation provided regarding approval of WSW IMP provided. It is noted that the WSW IMP has been prepared and provided to BCD. Non-compliance is mainly due to the document not yet being approved by BCD (i.e not approved within 12 months of the commencement of the development.	Work with BCD to progress the outstanding approval as a high priority.	This is noted in the audit report as an administrative non-compliance. No progress was achieved in the 2024 Annual Review period. MTW will work with BCS to progress toward approval of the WSW IMP during the 2025 Annual review period.
S3 C51	The Applicant must: a) keep records of the amount of coal transported from the	The 2020 and 2021 Annual Reviews are publicly available on the MTW website; however, the 2022 Annual Review was not on the website at the time of this IEA. Therefore, the coal transport records for 2022 were not publicly available as required by this Condition. The Auditor notes that the 2022	Ensure that the coal transportation records are regularly updated.	Although this is noted in the audit report as an administrative non-compliance, MTW does not agree with this audit finding. Coal transportation records are included in the Annual Review report submitted to DPHI. The 2022 Annual Review Report was approved by DPHI 20/11/2023 and was uploaded to the MTW website that day. The

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
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	development in each calendar year; and b) make these records available on its website at the end of each calendar year.	Annual Review had been submitted to DPE but had not yet been approved.		2023 Annual Review Report was approved by DPHI 1/08/2024 and was uploaded to the MTW website 12/08/2024.
S3 C52 a and c	The Applicant must: a) implement all reasonable and feasible measures to minimise the visual off-site lighting impacts of the development, including lighting impacts on road users and impacts of mining voids; b) ensure that all external lighting associated with the development complies with Australian Standard AS4282 (/NT) 1997 - Control of Obtrusive Effects of Outdoor Lighting, or its latest	Environmental induction covers lighting. The Lighting review undertaken in 2020 confirms the offsite lighting impacts was meeting the requirements of this condition. However, 94 lighting complaints were received during the audit period, 75 of those complaints came from three residents. A review of the complaints indicates that the community impacts are from relocatable lighting and mobile plant, but that fixed lighting is not generating complaints. As part of the internal complaint investigations, CROs assess mobile lighting and arrange changes in light locations or direction and that the actions, in general resolve the issues. It is apparent that there is insufficient planning for the location and use of mobile lighting and therefore all reasonable and feasible mitigation measures have not been used.	Ensure that personnel responsible for planning and / or managing night works undertake proactive planning for all after hours works. The planning should identify the optimal lighting setup for those activities and that the implementation of the lighting plans be checked prior to undertaking those activities by CROs or other appropriately trained personnel.	As stated in the audit finding, a review of lighting was conducted in 2020 (by an environmental/engineering consultant) specifically against AS4282, which confirmed that offsite lighting impacts were meeting the requirements of development consent condition S3 C52. In relation to potential lighting impacts from lighting plant, MTW has developed and implements processes involved with the siting and set up of lighting plant designed to minimise the risk of intrusive light impacts. MTW also conducts an inspection of established lighting as part of a routine process by Community Response Officers (CROs) on night shift – this occurs each night as a routine inspection and feedback to operations to make adjustments where necessary, and also will occur in response to community complaint regarding lighting. This represents significant effort regarding management of potential lighting impacts. 17 lighting complaints were received in 2023 and 2024, a reduction compared to previous years.
S3 C57	The Applicant must rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies must be employed when areas prone to dust generation cannot yet be permanently rehabilitated.	Annual Review reports detail progress of mine rehabilitation progress against MOP plans. The net rehabilitation progress (i.e. rehabilitation minus rehabilitation disturbance) for the 2015 – 2021 period was 20.4 ha higher than targets. A total of 47.9ha of new rehabilitation was completed during 2022 against a Mining Operations Plan 2022 target of 35ha. 2022 annual report notes that rehabilitation and disturbance forecasts submitted to Resources Regulator (submitted in August 2022) are based on financial year periods and therefore don't align with the calendar year Annual Review reporting period and the misalignment is intended to be corrected in the Forward Program to be submitted in May 2023.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets.	MTW undertakes progressive rehabilitation as reported in previous Annual Review Reports and as planned in previous Mining Operations Plans (now Rehabilitation Management Plan). MTW submits a Forward Program to the Resources Regulator each year which outlines the next 3 years rehabilitation progress. In 2024, MTW completed 100.6Ha of rehabilitation, which exceeded the planned rehabilitation target of 81.2Ha for 2024. MTW continued proactive dump planning and review in 2023- 2024, with the resulting planned rehabilitation to be submitted with the updated Forward Program submissions each year in March.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
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S3 C58 d, and h	d) Describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy; h) include interim rehabilitation where necessary to minimise the area exposed for dust generation;	The RMP does not address the integration of the mine site rehabilitation with the biodiversity off-set strategy. The RMP does not address the interim rehabilitation of the site to minimise dust generation.	Review and revise the plan to include the integration of the mine site rehabilitation with the biodiversity off-set strategy. Review and revise the plan to include the interim rehabilitation of the site to minimise dust generation.	Completed. The Rehabilitation Management Plan was updated (finalised 29 January 2024) and has addressed this IEA recommendations. RMP is available on the MTW website.
SSD-6465				
S3 C17 a and c	The Applicant must: a) implement all reasonable and feasible measures to minimise the: • odour, fume and dust emissions of the development; and • release of greenhouse gas emissions from the development; minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events (see note d to Tables 5-7 above); and	The Air quality management plan describes the air quality management system and procedures including the predictive tools. Fifty-eight dust-related complaints were received during the audit period. No exceedances in dust criteria were reported during the audit period. Areas of the site are being cleared in preparation for mining, and the disposal of overburden is progressing. The planned progressive rehabilitation works are, however, behind schedule. The Auditor also observed areas, that while not ready for final rehabilitation, would benefit from temporary stabilisation to help reduce dust emissions during adverse wind conditions	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets. Prepare and implement a program for the stabilisation of unsealed / disturbed areas of the site including stockpiles, finished landforms, and disturbed areas that are not currently being actively worked / filled). The program should identify and classify all areas of the site that are currently disturbed according to the dust generation potential of those areas and establish clear targets for the stabilisation of those areas (either permanent or temporary) with the objective of meeting the requirements of the Blue Book.	MTW notes that the audit found there were no exceedances in dust criteria reported during the audit period. MTW has a well developed and implemented Air Quality Management Plan and considers that reasonable and feasible controls are being implemented. Refer to response to SSD-6464 S3 C19.
S3 C22 a and b	Unless an EPL or the EPA authorises otherwise, the Applicant must ensure that all surface water discharges from the site comply with the: discharge limits (both volume and quality) set for the development in any EPL; and	The Annual Returns prepared for the Environment Protection Licence 1976 noted several non-compliances with this condition. • Dam 1S overtopped as a result of heavy or sustained rainfall which caused significant runoff (2023 AR) • Dam 1S overtopped as a result of heavy or sustained rainfall which caused significant runoff (2021 AR) • Discharge from 9S via spillway to Loders Creek (2021 AR)	A risk assessment and review of the storage capacity of the retention dams be undertaken that takes into account the increasing risk of extreme weather events, including extended duration wet weather patterns.	Completed. Refer to response to SSD-6464 S3 C24.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
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	relevant provisions of the POEO Act or Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002	As reported in the 2021 Annual Return for EPL1976, Exceedance of the HRSTS hourly volume discharge limit during analysis of flow data following a discharge event. Note that this incident was not reported in the 2021 Annual Review.	The auditor understands that this discharge was an isolated event and has been investigated. No additional actions are required.	Noted
S3 C27	Within 3 years of the commencement of development under this consent, unless the Planning Secretary agrees otherwise, the Applicant must enter into a conservation agreement or agreements pursuant to section 698 of the National Parks and Wildlife Act 1974 relating to the Loaders Creek Aboriginal Cultural Heritage Conservation Area, recording the obligations assumed by the Applicant under the conditions of this consent in relation to the conservation area, and register the agreements pursuant to section 69F of the National Parks and Wildlife Act 1974.	The Department approved a request to extend the timeframe for completion of the agreement to the 15th of February 2020, however the agreement was not executed until the 3 November 2022. Whilst the conservation agreement has been entered into in November 2022, registration of the agreements has not been completed pursuant to s69F of the NPW Act.	Finalise the registration of the conservation agreement for Loders Creek.	This is noted in the audit report as an administrative non-compliance. The registration process for the Loders Creek Aboriginal Cultural Heritage Conservation Area conservation agreement that were executed on 3 November 2022 has progressed in 2024 with MTW and Heritage NSW/NPWS but is not completed. In 2024, the NPWS Deputy Secretary signed the registration documents, and progressed to NPWS legal team ahead of lodgement with Land Registry Service. This process will continue in the 2025 Annual Review Period.
S3 C29 a and b	The Applicant must: a) keep records of the amount of coal transported from the development in each calendar year; and b) make these records available on its website at the end of each year.	The 2020 and 2021 Annual Reviews are publicly available on the MTW website; however, the 2022 Annual Review was not on the website at the time of this IEA. Therefore, the coal transport records for 2022 were not publicly available as required by this Condition. The Auditor notes that the 2022 Annual Review had been submitted to DPE but had not yet been approved.	Ensure that the coal transportation records are regulatory updated.	Although this is noted in the audit report as an administrative non-compliance, MTW does not agree with this audit finding. Coal transportation records are included in the Annual Review report submitted to DPHI. The 2022 Annual Review Report was approved by DPHI 20/11/2023 and was uploaded to the MTW website that day. The 2023 Annual Review Report was approved by DPHI 1/08/2024 and was uploaded to the MTW website 12/08/2024.
S3 C30 a and c	The Applicant must: a) implement all reasonable and feasible measures to minimise the visual and off-site lighting impacts of the development, including lighting impacts on road users and impacts of mining voids; c) ensure that all external lighting associated with the development complies with Australian Standard AS4282 (/NT) 1997 - Control of Obtrusive Effects of Outdoor Lighting, or its latest version; and	Environmental induction covers lighting. The Lighting review undertaken in 2020 confirms the offsite lighting impacts was meeting the requirements of this condition. However, 94 lighting complaints were received during the audit period, 75 of those complaints came from three residents. A review of the complaints indicates that the community impacts are from relocatable lighting and mobile plant, but that fixed lighting is not generating complaints. As part of the internal complaint investigations, CROs assess mobile lighting and arrange changes in light locations or direction and that the actions, in general resolve the issues. It is apparent that there is insufficient planning for the location and use of mobile lighting and therefore all reasonable and feasible mitigation measures have not been used.	Ensure that personnel responsible for planning and / or managing night works undertake proactive planning for all after hours works. The planning should identify the optimal lighting setup for those activities and that the implementation of the lighting plans be checked prior to undertaking those activities by CROs or other appropriately trained personnel.	Refer to response to SSD-6464 S3 C52.

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S3 C36g	The RMP must: g) include interim rehabilitation where necessary to minimise the area exposed for dust generation;	The RMP does not address the interim rehabilitation of the site to minimise dust generation.	Review and revise the plan to include the interim rehabilitation of the site to minimise dust generation.	Completed. This is noted in the audit report as an administrative non-compliance. Temporary stabilisation of unused areas or dump slopes (foreshadowed to be inactive for 6 months or more) is described as a management strategy in the MTW Air Quality Management Plan. The Rehabilitation Management Plan was updated (finalised 29 January 2024) and has addressed this IEA recommendations. RMP is available on the MTW website.
EPL1376				
L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	The following non- compliances (generally associated with over topping of dams) were identified by the Annual Returns • WML Sediment Dams 53N, 54N and WML sump 5N overtopped as a result of heavy rainfall - 5 in total non-compliances reported (2022 AR) • WML Sediment Dams 53N, 54N, 55N, 46N SSD 09 - 4 in total (2021 AR) • WML sediment dames 50N and 53N overtopped as a result of heavy rainfall	A risk assessment and review of the storage capacity of the retention dams be undertaken that takes into account the increasing risk of extreme weather events, including extended duration wet weather patterns.	Completed. Refer to response to SSD-6464 S3 C24.
O3.1	The premises must be maintained in a condition which minimizes or prevents the emission of dust from the premises.	Fifty-eight dust-related complaints were received during the audit period. No exceedances in dust criteria were reported during the audit period. Significant areas of the site have been cleared and progressive rehabilitation works are behind schedule. The Auditor also observed significant areas, that while not ready for final rehabilitation, would benefit from temporary stabilisation to help reduce dust emissions during adverse wind conditions.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets. Prepare and implement a program for the stabilisation of unsealed / disturbed areas of the site including stockpiles, finished landforms, and disturbed areas that are not currently being actively worked / filled). The program should identify and classify all areas of the site that are currently disturbed according to the dust generation potential of those areas and establish clear targets for the stabilisation of those areas (either permanent or temporary) with the objective of meeting the requirements of the Blue Book.	Refer to response to SSD-6464 S3 C19.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
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M2.2	Air Monitoring Requirements: Continuous PM10 monitoring	As reported in the 2020, 2021 and 2022 Annual Returns, EPL 1376 requires continuous monitoring for EPA air monitoring Points 9, 10, 11 and 12. Monitoring data capture was >93%, but not continuous during the reporting period (4 occurrences)	Ensure that all continuous monitoring equipment is operational and well maintained.	Completed. Monitoring locations are subject to routine maintenance and calibration and system checks. Unplanned outages can occur at times with all continuous monitoring equipment. Scheduled maintenance is undertaken which can take monitoring equipment offline for 10 minutes or more due to the nature of the maintenance. Calibrations need to continue to occur and so brief outages will happen from time to time. As the audit noted, this is reported in Annual Returns to EPA. No further action required.
M2.3	Water and/or Land Monitoring Requirements	As reported in the Annual Returns, EPL water monitoring Points 26, 27, 28 and 30 were unable to be sampled due to sample area either unsafe to access due to rain events resulting in flooding, or being dry at time of sampling (6 occurrences)	Access to the sampling sites was not possible due to adverse weather conditions. No further actions are recommended.	This is noted in the audit report as an administrative non-compliance. Noted.
M4.1	Meteorological Monitoring Requirements	As reported in the 2021 and 2022 Annual Returns, EPL 1376 requires continuous monitoring for Charlton Ridge Meteorological Station. Monitoring data capture was >99%, but not continuous during the reporting period.	Ensure that all continuous monitoring equipment is operational and well maintained.	This is noted in the audit report as an administrative non-compliance. Completed. Monitoring locations are subject to routine maintenance and calibration. Unplanned outages can occur at times with all continuous monitoring equipment. Scheduled maintenance is undertaken at the met station and this can take monitoring equipment offline for 10 minutes or more due to the nature of the maintenance, which for example necessitates periodic lowering of the mast on which the wind speed and direction sensor is located and changing out sensors/calibrating etc. Calibrations need to continue to occur and so brief outages will happen from time to time. As the audit noted, this is reported in Annual Returns to EPA. No further action required.
M9.3	The licence must mark monitoring point(s) 4, with a sign which clearly indicates the name of the licensee, whether the monitoring point is up or down stream of the discharge point(s) and that it is a monitoring point for the Hunter River Salinity Trading Scheme.	The required signage was not installed at the time of this IEA.	Ensure that signage for Monitoring Point 4 is installed.	Completed. Signage installed on 30 August 2023
EPL1976				
L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	The following non- compliances were identified by the Annual Returns • Dam 1S overtopped as a result of heavy or sustained rainfall which caused significant runoff (2023 AR) • Dam 1S overtopped as a result of heavy or sustained rainfall which caused significant runoff (2021 AR) • Discharge from 9S via spillway to Loders Creek (2021 AR)	A risk assessment and review of the storage capacity of the retention dams be undertaken that takes into account the increasing risk of extreme weather events, including extended duration wet weather patterns.	Completed. Refer to response to SSD-6464 S3 C24.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
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L2.1	For each monitoring/ discharge point or utilisation area specified in the table/s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.	One non-compliance was reported during the audit period. During 2021 one Grab Sample at Licensed Discharge and Monitoring Point 4 exceeded the upper 100 percentile limit for pH.	This single exceedance of the water quality criteria has been investigated. No systemic issues have been identified therefore no further actions are recommended.	Noted.
L2.2	Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.	One non-compliance was reported during the audit period. During 2021 one Grab Sample at Licensed Discharge and Monitoring Point 4 exceeded the upper 100 percentile limit for pH.	This single exceedance of the water quality criteria has been investigated. No systemic issues have been identified therefore no further actions are recommended.	Noted.
03.1	The premises must be maintained in a condition which minimizes or prevents the emission of dust from the premises.	Fifty-eight dust-related complaints were received during the audit period. Significant areas of the site have been cleared and progressive rehabilitation works are behind schedule. The Auditor also observed areas, that while not ready for final rehabilitation, would benefit from temporary stabilisation to help reduce dust emissions during adverse wind conditions. While no exceedances in dust criteria were reported during the audit period, the number of dust related complaints and the Auditor's observations relating to rehabilitation and stabilisation indicate that nuisance dust emissions are being generated by the mine.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets. Prepare and implement a program for the stabilisation of unsealed / disturbed areas of the site including stockpiles, finished landforms, and disturbed areas that are not currently being actively worked / filled). The program should identify and classify all areas of the site that are currently disturbed according to the dust generation potential of those areas and establish clear targets for the stabilisation of those areas (either permanent or temporary) with the objective of meeting the requirements of the Blue Book.	Refer to response to SSD-6464 S3 C19.
M2.1	For each monitoring/ discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns.	During 2021, 2022 and 2023 Table M2.2 requires continuous PM10 monitoring for EPA air monitoring points 10,11,13 and 19. Monitoring data capture was >98% but not continuous during the reporting period. During 2021, 2022 and 2023 Table M2.3 requires continuous monitoring for pH at Point 4 during Discharge Monitoring data capture was >99% but not continuous during the reporting period. During 2021, 2022 and 2023 Table M2.3 requires continuous monitoring for conductivity at Point 4 during Discharge Monitoring data capture was >99% but not continuous during the reporting period.	Ensure that all continuous monitoring equipment is operational and well maintained.	Completed. Monitoring locations are subject to routine maintenance and calibration. Unplanned outages can occur at times with all continuous monitoring equipment. Scheduled maintenance is undertaken at the continuous monitoring locations and this can take monitoring equipment offline for 10 minutes or more due to the nature of the maintenance. Calibrations need to continue to occur and so brief outages will happen from time to time. As the audit noted, this is reported in Annual Returns to EPA. No further action required.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
Ref	**Compliance Requirement**	**Independent Audit Finding**	**Independent Audit Recommendation**	**MTW Response / Progress**
M4.1	Meteorological Monitoring Requirements	As reported in the 2021 and 2022 Annual Returns, EPL 1376 requires continuous monitoring for Charlton Ridge Meteorological Station. Monitoring data capture was >99%, but not continuous during the reporting period.	Ensure that all continuous monitoring equipment is operational and well maintained.	Completed. Monitoring locations are subject to routine maintenance and calibration. Unplanned outages can occur at times with all continuous monitoring equipment. Scheduled maintenance is undertaken at the met station and this can take monitoring equipment offline for 10 minutes or more due to the nature of the maintenance, which for example necessitates periodic lowering of the mast on which the wind speed and direction sensor is located and changing out sensors/calibrating etc. Calibrations need to continue to occur and so brief outages will happen from time to time. As the audit noted, this is reported in Annual Returns to EPA. No further action required.
M7.1	Requirement to monitor volume or mass.	Table M7.1 requires continuous monitoring for volumetric flow at Point 4 during discharge. During 2021 monitoring data capture was not continuous during the reporting period.	Ensure that all continuous monitoring equipment is operational and well maintained.	Completed. Daily system checks are undertaken on working days to identify and resolve any monitoring issues. The monitors also undergo routine maintenance. As the audit noted, this was reported in the 2021 Annual return to EPA. No further action required.
E1.3	The licensee must not exceed the hourly volume discharge limit calculated using the following formula, at all discharge point(s) on this licence titled "Discharge of saline water under the Hunter River Salinity Trading Scheme (HRSTS)". H = V/ RRT	As reported in the 2021 Annual Return an exceedance of the HRSTS hourly volume discharge limit occurred on 20 March 2021. This non-compliance was discovered during the preparation of the 2021 Annual Return. The exceedance event has been reviewed by MTW and the discharge rate modified. No further exceedances have been recorded.	The single volume exceedance has been investigated and appropriate actions taken to prevent future exceedances. No additional actions have been identified.	Noted.
Mining Lease Standard Conditions (from July 2022)				
D1 C4	The holder of a mining lease must take all reasonable measures to prevent, or if that is not reasonably practicable, to minimise, harm to the environment caused by activities under the mining lease.	During the audit period (2021) non-complying overflows / discharges of water occurred from dams on both the Mt Thorley and Warkworth mines. These pollution events resulted in the issue of Penalty Notices by the EPA and DPE. For further information refer to Section 7.3 and Condition L1.1 on the EPL Compliance Registers above.	A risk assessment and review of the storage capacity of the retention dams be undertaken that takes into account the increasing risk of extreme weather events, including extended duration wet weather patterns.	Completed. Refer to response to SSD-6464 S3 C24.
D1 C5	The holder of a mining lease must rehabilitate land and water in the mining area that is disturbed by activities under the mining lease as soon as reasonably practicable after the disturbance occurs.	This condition is considered to be non-compliant as the predicted/forecast target for 2020 was not met and it is predicted that the forecast for 2023 will not be met. It is acknowledged that several factors, including weather conditions, have resulted in lower rehabilitation than predicted. It is noted however that the MOP rehabilitation targets were exceeded in both 2021 and 2022.	Continue progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets	Refer to response to SSD-6464 S3 C57.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
Ref	**Compliance Requirement**	**Independent Audit Finding**	**Independent Audit Recommendation**	**MTW Response / Progress**
ML 1412				
17	Minimise Dust	Fifty-eight dust-related complaints were received during the audit period. No exceedances in dust criteria were reported during the audit period. Significant areas of the site have been cleared and progressive rehabilitation works are behind schedule. The Auditor also observed significant areas, that while not ready for final rehabilitation, would benefit from temporary stabilisation to help reduce dust emissions during adverse wind conditions.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets. Prepare and implement a program for the stabilisation of unsealed / disturbed areas of the site including stockpiles, finished landforms, and disturbed areas that are not currently being actively worked / filled). The program should identify and classify all areas of the site that are currently disturbed according to the dust generation potential of those areas and establish clear targets for the stabilisation of those areas (either permanent or temporary) with the objective of meeting the requirements of the Blue Book.	Refer to response to SSD-6464 S3 C19.
27	Environment Protection / Prevention of Pollution	The Annual Returns prepared for the Environment Protection Licence 1276 noted several non-compliances with this condition. Refer to audit schedule for EPL 1376 for details.	A risk assessment and review of the storage capacity of the retention dams be undertaken that takes into account the increasing risk of extreme weather events, including extended duration wet weather patterns.	Completed. Refer to response to SSD-6464 S3 C24.
CCL753				
2	Operate in accordance with the Mining Operations Plan	Annual Review reports detail progress of mine rehabilitation progress against MOP plans. The net rehabilitation progress (i.e. rehabilitation minus rehabilitation disturbance) for the 2015 – 2021 period was 20.4 ha higher than targets. A total of 47.9ha of new rehabilitation was completed during 2022 against a Mining Operations Plan 2022 target of 35ha. 2022 annual report notes that rehabilitation and disturbance forecasts submitted to Resources Regulator (submitted in August 2022) are based on financial year periods and therefore don't align with the calendar year Annual Review reporting period and the misalignment is intended to be corrected in the Forward Program to be submitted in May 2023.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets.	Refer to response to SSD-6464 S3 C57.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
Ref	**Compliance Requirement**	**Independent Audit Finding**	**Independent Audit Recommendation**	**MTW Response / Progress**
16	Minimise Dust	Fifty-eight dust-related complaints were received during the audit period. No exceedances in dust criteria were reported during the audit period. Significant areas of the site have been cleared and progressive rehabilitation works are behind schedule. The Auditor also observed significant areas, that while not ready for final rehabilitation, would benefit from temporary stabilisation to help reduce dust emissions during adverse wind conditions.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets. Prepare and implement a program for the stabilisation of unsealed / disturbed areas of the site including stockpiles, finished landforms, and disturbed areas that are not currently being actively worked / filled). The program should identify and classify all areas of the site that are currently disturbed according to the dust generation potential of those areas and establish clear targets for the stabilisation of those areas (either permanent or temporary) with the objective of meeting the requirements of the Blue Book.	Refer to response to SSD-6464 S3 C19.
25	Environment Protection / Prevention of Pollution	The Annual Returns prepared for the Environment Protection Licence 1376 noted several non-compliances with this condition. Refer to audit schedule for EPL 1376 for details.	A risk assessment and review of the storage capacity of the retention dams be undertaken that takes into account the increasing risk of extreme weather events, including extended duration wet weather patterns.	Completed. Refer to response to SSD-6464 S3 C24.
ML1590				
2	Operate in accordance with the Mining Operations Plan	Annual Review reports detail progress of mine rehabilitation progress against MOP plans. The net rehabilitation progress (i.e. rehabilitation minus rehabilitation disturbance) for the 2015 – 2021 period was 20.4 ha higher than targets. A total of 47.9ha of new rehabilitation was completed during 2022 against a Mining Operations Plan 2022 target of 35ha. 2022 annual report notes that rehabilitation and disturbance forecasts submitted to Resources Regulator (submitted in August 2022) are based on financial year periods and therefore don't align with the calendar year Annual Review reporting period and the misalignment is intended to be corrected in the Forward Program to be submitted in May 2023.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets.	Refer to response to SSD-6464 S3 C57.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
Ref	**Compliance Requirement**	**Independent Audit Finding**	**Independent Audit Recommendation**	**MTW Response / Progress**
13	Rehabilitate the site in accordance with the MOP	Annual Review reports detail progress of mine rehabilitation progress against MOP plans. The net rehabilitation progress (i.e. rehabilitation minus rehabilitation disturbance) for the 2015 – 2021 period was 20.4 ha higher than targets. A total of 47.9ha of new rehabilitation was completed during 2022 against a Mining Operations Plan 2022 target of 35ha. 2022 annual report notes that rehabilitation and disturbance forecasts submitted to Resources Regulator (submitted in August 2022) are based on financial year periods and therefore don't align with the calendar year Annual Review reporting period and the misalignment is intended to be corrected in the Forward Program to be submitted in May 2023.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets.	Refer to response to SSD-6464 S3 C57.
ML1751				
3	Operate in accordance with the Mining Operations Plan	Annual Review reports detail progress of mine rehabilitation progress against MOP plans. The net rehabilitation progress (i.e. rehabilitation minus rehabilitation disturbance) for the 2015 – 2021 period was 20.4 ha higher than targets. A total of 47.9ha of new rehabilitation was completed during 2022 against a Mining Operations Plan 2022 target of 35ha. 2022 annual report notes that rehabilitation and disturbance forecasts submitted to Resources Regulator (submitted in August 2022) are based on financial year periods and therefore don't align with the calendar year Annual Review reporting period and the misalignment is intended to be corrected in the Forward Program to be submitted in May 2023.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets.	Refer to response to SSD-6464 S3 C57.

NON-COMPLIANCE RECOMMENDATIONS AND RESPONSES				
Ref	**Compliance Requirement**	**Independent Audit Finding**	**Independent Audit Recommendation**	**MTW Response / Progress**
CL219				
2	Operate in accordance with the Mining Operations Plan	Annual Review reports detail progress of mine rehabilitation progress against MOP plans. The net rehabilitation progress (i.e., rehabilitation minus rehabilitation disturbance) for the 2015 – 2021 period was 20.4 ha higher than targets. A total of 47.9ha of new rehabilitation was completed during 2022 against a Mining Operations Plan 2022 target of 35ha. 2022 annual report notes that rehabilitation and disturbance forecasts submitted to Resources Regulator (submitted in August 2022) are based on financial year periods and therefore don't align with the calendar year Annual Review reporting period and the misalignment is intended to be corrected in the Forward Program to be submitted in May 2023.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets.	Refer to response to SSD-6464 S3 C57.
17	Minimise Dust	Fifty-eight dust-related complaints were received during the audit period. No exceedances in dust criteria were reported during the audit period. Significant areas of the site have been cleared and progressive rehabilitation works are behind schedule. The Auditor also observed significant areas, that while not ready for final rehabilitation, would benefit from temporary stabilisation to help reduce dust emissions during adverse wind conditions.	Increase the rate of progressive rehabilitation works with the objective of meeting the established progressive rehabilitation targets. Prepare and implement a program for the stabilisation of unsealed / disturbed areas of the site including stockpiles, finished landforms, and disturbed areas that are not currently being actively worked / filled). The program should identify and classify all areas of the site that are currently disturbed according to the dust generation potential of those areas and establish clear targets for the stabilisation of those areas (either permanent or temporary) with the objective of meeting the requirements of the Blue Book.	Refer to response to SSD-6464 S3 C57.
25	Environment Protection / Prevention of Pollution	The Annual Returns prepared for the Environment Protection Licence 1976 noted several non-compliances with this condition. Refer to audit schedule for EPL 1976 for details. • Dam 1S overtopped as a result of heavy or sustained rainfall which caused significant runoff (2023 AR) • Dam 1S overtopped as a result of heavy or sustained rainfall which caused significant runoff (2021 AR) • Discharge from 9S via spillway to Loders Creek (2021 AR)	A risk assessment and review of the storage capacity of the retention dams be undertaken that takes into account the increasing risk of extreme weather events, including extended duration wet weather patterns.	Completed. Refer to response to SSD-6464 S3 C24.

CONTINUOUS IMPROVEMENT RECOMMENDATIONS		
Ref	**Independent Audit Recommendation**	**MTW Response / Progress**
SSD 6464 S3 C27 / SSD 6465 S3 C25	It is recommended that MTW review the water balance model to take into account the impacts of climate change, for example the impacts of higher-than-normal rainfall events due to more extreme La-Nina events.	At the next Water Balance Update, MTW will seek advice from water balance experts to review rainfall inputs to water balance model. Where an improved rainfall dataset/model inputs are available MTW will seek to incorporate in the next Water Balance update.
SSD 6464 S3 C27 / SSD 6465 S3 C25	That the Water Balance documented in the WMP is updated to reflect water volumes and quality from the STP, as well as any necessary treatment and/or testing of the waters discharged.	MTW has reviewed this recommendation and does not intend to implement this recommendation. On site sewage management (OSSM) is already approved and regulated by Singleton Council and is included on relevant Environment Protection Licences. The volumes from these systems is not large in the context of a mine water balance, so provide no improvement to water balance understanding.
SSD 6464 S3 C29 / SSD 6464 S3 C56	To improve the success of the rehabilitation works and to achieve the targets detailed in the Ecological monitoring reports, that: • More intensive weed control of High Threat Weeds be undertaken; • Control of overly dominant natives (e.g Corymbia maculate, Acacia species) via thinning or changes to seed mix; and • Widen the distribution of ground habitat features (such as logs);	Weed control works in rehabilitation areas is ongoing. MTW undertakes monitoring, rehabilitation inspections which then guide weed control effort in rehabilitation areas. Weed control in rehabilitation areas is currently constrained by available resources (land management crews). MTW has introduced an additional land management contractor to some land management aspects at MTW, which may alleviate resource constraints in future. Native seed mixes for MTW rehabilitation areas were reviewed in May 2020 to remove dominant species that are not considered to be a significant component of the target Grey Box – Ironbark Woodland (GBIBW) vegetation community. Relevant to this audit finding, the following species were changed to back-up species that would only be included in seed mixes if other GBIBW species were not available and at a reduced sowing rate when used: Corymbia maculata, Acacia crassa, Acacia elongata, and Acacia spectabilis. Acacia cultriformis has also been found to be dominant in some rehabilitation areas so the maximum sowing rate has also been reduced for this species. Thinning of Corymbia maculata will be conducted as required but may be intentionally delayed to allow sufficient tree growth to contribute towards the relevant habitat performance criteria (i.e. Length of Logs on the Ground (m) at least 10cm in diameter). The seed mix review recommendation was completed May 2020. The thinning recommendation is subject to ongoing review. Rehabilitation work program to increase distribution of ground habitat features through continued placement of salvaged logs in rehabilitation areas will continue in the next IEA period as an ongoing work item.
SSD 6464 S3 C29	That any future modification to the Approval consider seeking to remove specific mentions of the use of the NSW Biodiversity Offsets Policy for Major Projects as this is no longer available.	MTW agrees this would assist with clarity for Biodiversity descriptions in the consent, and is happy to engage with DPE on this matter for any future modifications for SSD 6464. It is noted that a modification is currently in progress (SSD 6464 MOD1) which seeks to address biodiversity offset conditions of the consent, given the change to biodiversity offset regulation.
SSD 6464 S3 C32	Warkworth Sands Woodland – Additional work is required to meet the final performance criteria, In particular it is recommended that consideration is given to amending seed mixes to include a higher diversity of non-grass native species to increase groundcover diversity. Restoration work scheduled for 2022 was delayed due to access issues associated with inclement weather and that works have been rescheduled for 2023. Based on the ecologist field observations, further active works, particularly in regard to increasing groundcover diversity, may be required to meet the required performance criteria by Year 15.	Native grass and non-grass seeding undertaken in May 2024 throughout all Autumn 2024 planting areas in Southern Biodiversity Area 3 and the Northern Biodiversity Area. Non-grass groundcovers seeded included Dichondra repens, Dianella longifolia/caerulea and Hardenbergia violacea.