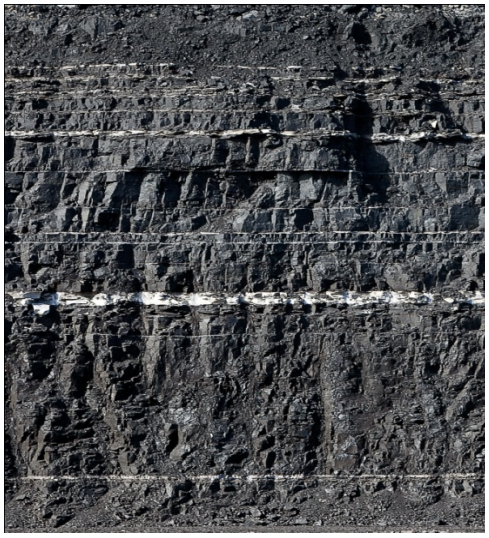
YANCOAL
兖煤澳大利亚有限公司
MT THORLEY WARKWORTH



Mount Thorley Warkworth

2020 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
MOP/RMP start date	24/11/2020
MOP/RMP end date	30/11/2021
Annual Review Start Date	01/01/2020
Annual Review End Date	31/12/2020

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 2020 to 31 December 2020 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	29/4/2021

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 2020 to 31 December 2020.

This report has been prepared in accordance with conditions of the development consents and Mining Leases (ML) held by MTW which require a report of the operation's environmental performance to be provided on an annual basis. The structure of the 2020 Annual Review aligns with the NSW Department of Planning, Industry and Environment (DPIE) *Post-approval requirements for State significant mining developments – Annual Review Guideline* (October 2015).

MTW produced 17.5 million tonnes of run-of-mine (ROM) coal during 2020, and 11.9 million tonnes of saleable coal, against an approved ROM coal production rate of 28 million tonnes per annum (mtpa).

Noise

There were no non-compliances recorded against MTW's consented noise limits. There was a decrease (from 94 to 72) in the number of supplementary attended noise measurements which exceeded the internal trigger levels for corrective action compared to 2019. A total of up to 1,090 hours of mine stoppages were recorded due to proactive and reactive measures to minimise noise and ensure compliance with noise criteria.

Blasting

During the reporting period 221 blast events were initiated at MTW. There were no non compliances against blasting conditions in MTWs development consents and licence conditions.

Air Quality

During 2020, MTW complied with all short term and annual average air quality criteria. A total of 1,526 hours of mine stoppage was recorded following implementation 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 MTW Aboriginal Heritage Management Plan (ACHMP) and Historic Heritage Management Plan (HHMP). No aboriginal heritage assessments or salvage programs were conducted at MTW in 2020.

Annual ACHMP and HHMP compliance inspections were conducted during the 2020 reporting period by a consultant archaeologist assisted by internal mine site personnel, representatives of the Aboriginal community and representatives from the sites Community Heritage Advisory Group (CHAG).

There were no incidents or any unauthorised disturbance to any heritage sites at MTW during the reporting period.

Surface Water

2020 was a wetter than average year with a total of 828.5 mm rainfall recorded at MTW's Charlton Ridge Meteorological station. The average annual rainfall at Charlton Ridge is 630mm, as calculated from 2007 to 2019 annual totals.

Construction of new sediment water management structures for the western advancing pre-strip at Warkworth commenced in quarter four 2020. These structures were designed in accordance with the NSW Blue Book, Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries.

There were two externally reportable water related incidents during the reporting period which occurred on 9 February 2020 and 14 May 2020. The incident on 9 February 2020 involved the overtopping of two boundary dams at Warkworth (Dam 50N and Dam 53N) as a result of a greater than design rainfall event (91.4 mm). WML received notification on 19 February 2020 from DPIE that they would not be taking action at this time and on the 2 March 2020 from the EPA stating they would not be taking any regulatory action. The incident on the 14 May involved the overtopping of a surface water dam at Mount Thorley Operations (Dam 9S) as a result of the automatic valve between Dam 6S and Dam 9S remaining open, permitting Dam 9S to fill and overtop. An official caution was received from the EPA in October 2020. Further details on this incident and the actions taken by MTW are provided in **Section 10**.

Groundwater

Groundwater monitoring activities were undertaken in 2020 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. There were no non-compliances related to groundwater in 2020.

Visual Amenity

The Putty Road visual bund, which was extended to the west to the junction of the Sealed Geo Road (former Wallaby Scrub Road) during 2019, was seeded in 2020. Vegetation screening has also been implemented to the west of the former Wallaby Scrub Road to improve visual amenity for passing motorists. A boundary fence audit was undertaken across MTW in May 2020 to identify fences that required repairs, maintenance or replacement. Maintenance of fence lines along Putty Road was undertaken in June 2020.

Rehabilitation and Land Management

A total of 38.5 ha of new rehabilitation was completed during 2020 against a MOP target of 43.8 ha. A further 45.6ha of Stage 2 rehabilitation was seeded with the target vegetation community seed mixes in 2020. Total disturbance undertaken was 50.6 ha, slightly lower than the 2020 MOP projection of 51.8 ha.

The net rehabilitation progress (i.e. rehabilitation minus rehabilitation disturbance) for the current MOP period (2015 to 2020) is 345.1ha, which is 43.3ha lower than the MOP target of 388.4ha. The net rehabilitation will exceed the MOP forecast after the planned new and Stage 2 rehabilitation is completed in 2021. Cumulative new disturbance over the MOP period is 424.6ha which is slightly lower than the MOP forecast of 426.6ha for the same period.

Biodiversity and Offset Management

Restoration of the Warkworth Sands Woodland vegetation community continued in the Northern Biodiversity Area, with 4,500 tube stock planted. Restoration activities for the Central Hunter Grey Box – Ironbark Woodland River Oak Forest and Warkworth Sands Woodland continued in the Southern Biodiversity Area, with 9,000 tube stock planted. Planting at the Goulburn River Biodiversity area to increase the suitability of habitat for the Regent Honeyeater commenced with 12,000 infill tube stock planted into the cleared areas of Yellow Box – Grey Box – Red Gum Grassy Woodland and riparian woodland areas. The annual Rapid Condition Assessments and biennial Bird and Habitat Restoration monitoring were undertaken across all Biodiversity Areas in 2020.

Weed control, vertebrate pest management activities, seed collection, and fence repairs were conducted during 2020 across all Biodiversity Areas 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)	No
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-6465 (MTO)	Schedule 3 Condition 22	Water Discharge	Non-compliant	10
SSD-6465 (MTO)	Schedule 3 Condition 6	Blasting Criteria	Non-compliant	9
SSD-6465 (MTO)	Schedule 3 Condition 27	Loders Creek Aboriginal Cultural Heritage Conservation Area	Non-compliant	9
SSD-6464 (WML)	Schedule 2 Condition 9	Surrender of Existing Development Consent	Non-compliant	9
SSD-6464 (WML)	Schedule 3 Condition 28	Retirement of Biodiversity Credits	Non-compliant	9
SSD-6464 (WML)	Schedule 3 Condition 30	Direct Land-Based Offsets	Non-compliant	9
SSD-6464 (WML)	Schedule 3 Condition 34	Additional Warkworth Sands Woodland Measures	Non-compliant	9
SSD-6464 (WML)	Schedule 3 Condition 43(c)	Aboriginal Heritage Management Plan – Research Program	Non-compliant	9

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) (**Figure 1**) situated 14 km southwest of Singleton, in the Upper Hunter Valley region of NSW. 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 2.**

2.1 Scope

This Annual Environmental Review (AER) covers the twelve-month reporting period from **1 January 2020 to 31 December 2020.**

This report summarises the environmental performance of MTW in accordance with conditions of the development consents and Mining Leases (ML) held by site. The structure of this 2020 Annual Review aligns with the *DPIE Post-approval requirements for State significant mining developments – Annual Review Guideline* (October 2015).

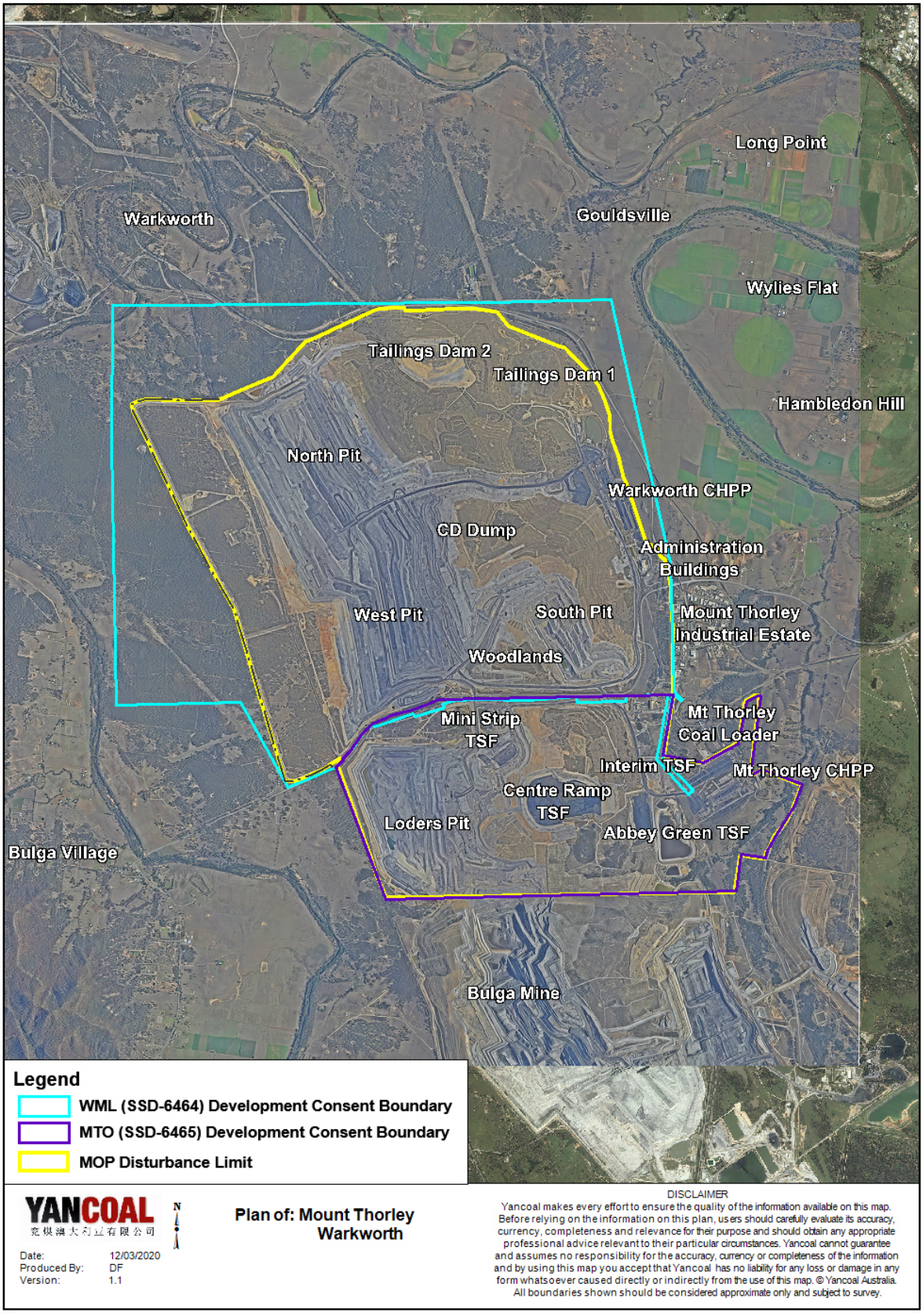


FIGURE 1: MTW SITE LAYOUT AND LOCALITY PLAN

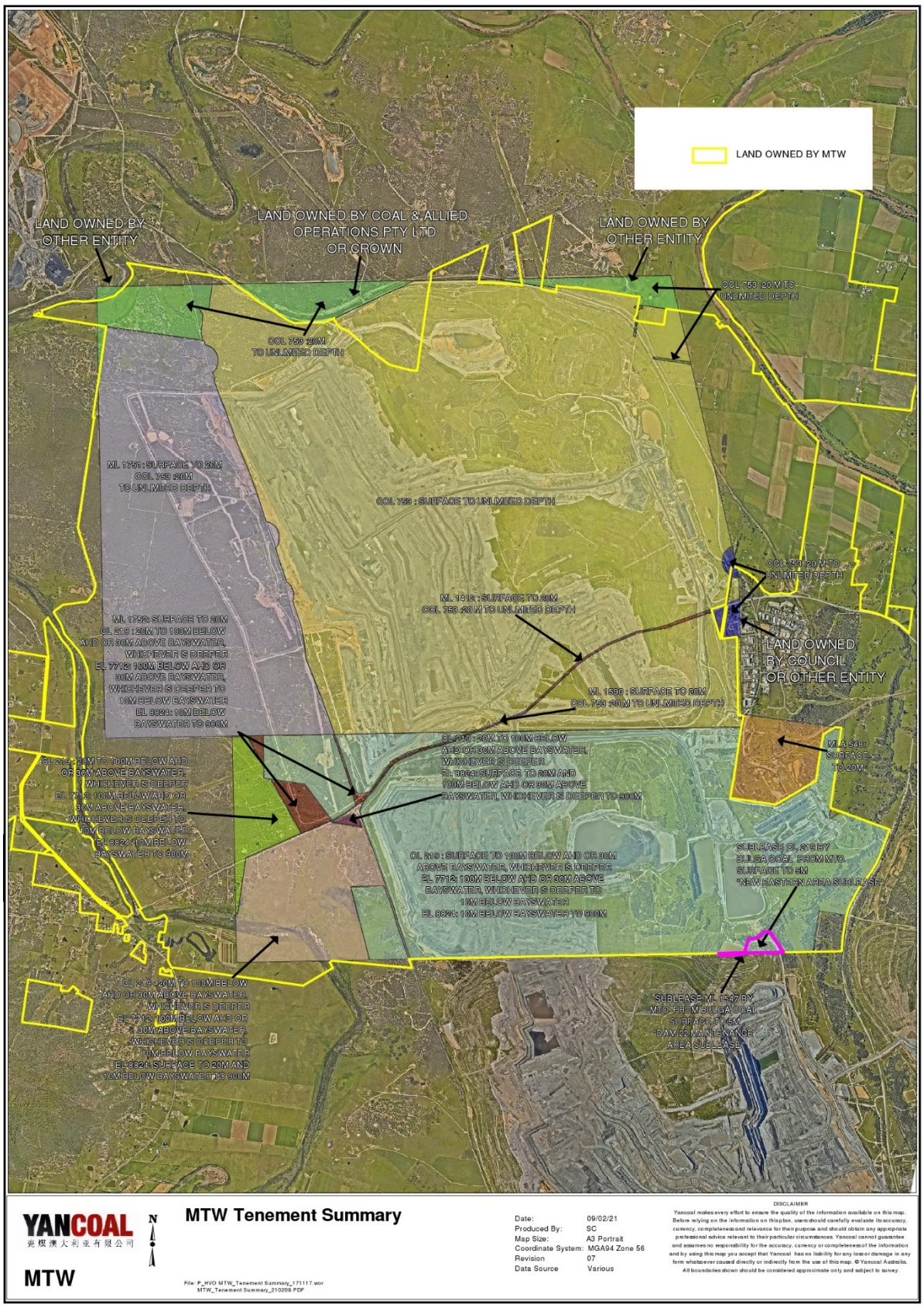


FIGURE 2: MTW TENEMENT SUMMARY

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	David Bennett	(02) 6570 1529
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 2020 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	DPIE	26/11/2015
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	Commonwealth Department of the Environment and Energy	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	Commonwealth Department of the Environment and Energy	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	DPIE	26/11/2015

TABLE 3.3 LICENCES AND PERMITS

Licence No	Description	Authority	Date of Approval / Variations
Warkworth			
EPL 1376	Environment Protection Licence	EPA	26/02/2020
5061122	Radiation Licence	EPA	01/07/2013
XSTR100160	Licence to Store – Explosives Act	WorkCover NSW	18/08/2019
Mount Thorley			
EPL 24	Environment Protection Licence	EPA	24/11/2016
EPL 1976	Environment Protection Licence	EPA	23/09/2020
5061110	Radiation Licence	EPA	01/07/2013

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	Prospecting and Mining Coal	Granted	23/05/1990	17/02/2023
ML 1412	Mining Lease	Prospecting and Mining Coal	Renewal Pending	11/01/1997	10/01/2018
ML 1590	Mining Lease	Prospecting and Mining Coal	Granted	27/02/2007	26/02/2028
ML 1751	Mining Lease	Prospecting, Mining Coal and Purposes	Granted	17/03/2017	17/03/2038

Mining tenement	Type	Purpose	Status	Grant Date	Expiry Date
Mount Thorley Operations Pty Ltd					
CL 219	Coal Lease	Prospecting and Mining Coal	Granted	23/09/1981	23/09/2023
(Part) ML 1547	Sub-Lease	Mining Purposes	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
ML 1752	Mining Lease	Prospecting, Mining Coal and Purposes	Granted	17/03/2017	17/03/2038
EL 7712	Exploration Licence	Prospecting Coal	Renewal Pending	23/2/2011	23/02/2020
EL 8824	Exploration Licence	Prospecting Coal	Granted	15/02/2019	15/02/2025
Mount Thorley Coal Loading Ltd					
MLA 548	Mining Lease Application	Mining Purposes	Application Pending	Mining Lease Application Lodged 13/11/2017	N/A

TABLE 3.5 WATER LICENCES

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

Licence Number	Type	Purpose	Legislation	Description	Renewal Date
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
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
20FW213276 (formerly 20CW802601)	Flood Work Approval	Block Dam	Water Management Act 2000	Charlton Rd Levee	Expired
20WA209905 (Formerly 20SL051292)	Stream Diversion	Bywash Dams	Water Management Act 2000	Doctors Creek Bywash	31 July 2022
20CA209904 WAL - 19022	Stream Diversion	Bywash Dams	Water Management Act 2000	Sandy Hollow Creek	25 February 2023

Water Licence 20FW213276 was reviewed prior to its expiration date in August 2020. MTW did not renew the licence as the flood works at the Charlton road Levee are approved under SSD 6465.

TABLE 3.6 WATER ACCESS LICENCES

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Licence Allocation (ML)*
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
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)
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
WAL10544	(Hunter Regulated River – Domestic and Stock)	Hunter River	Hunter Regulated River WSP	Zone 2b (Hunter River from Wollombi Brook Junction to Oakhampton Rail Bridge)	5
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
WAL18558	Hawkes	Wollombi Brook	Hunter Unregulated and Alluvial Water Sources WSP	Lower Wollombi Brook Water Source	50
WAL19022	Sandy Hollow Creek	Unregulated River	Hunter Unregulated and Alluvial Water Sources WSP	Singleton Water Source	60

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Licence Allocation (ML)*
WAL40464 (previously 20BL170011)	Mt Thorley Pit Excavation	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP	Sydney Basin – North Coast Groundwater Source	180
WAL40465 (previously 20BL170012)	Warkworth Pit Excavation	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP	Sydney Basin – North Coast Groundwater Source	750

** 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.

A Mining Operations Plan (MOP) was developed to replace the previous MOP and cover the existing MTW operations, as well as the approved operations outlined in the Environmental Impact Statements for the Warkworth Continuation 2014 and Mt Thorley Operations 2014. The MOP outlines the proposed operational and applicable environmental management activities planned for MTW. Details regarding the submission and approval dates for the current MOP are shown in **Table 3.8**.

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 (approval date)
Air Quality Management Plan	28/08/2019
Noise Management Plan	28/08/2019
Blast Management Plan	28/08/2019
Water Management Plan	13/05/2020
WML Biodiversity Management Plan	20/09/2018
Rehabilitation Management Plan (addressed in MOP)	24/11/2020 (MOP Amendment C)
Environmental Management Strategy	28/08/2019
MTW Historic Heritage Management Plan	11/10/2017
MTW Aboriginal Heritage Management Plan	28/08/2019
Wollombi Brook Aboriginal Cultural Heritage Conservation Area Conservation Management Plan	11/10/2017
Loder Creek Aboriginal Cultural Heritage Conservation Area Plan of Management	19/03/2019

Plan / Program / Strategy	Status (approval date)
Management Plan for Goulburn River Biodiversity Area	30/04/2018 (DP&E)
Management Plan for Bowditch Biodiversity Area	30/04/2018 (DP&E)
Management Plan for Southern Biodiversity Area	30/04/2018 (DP&E)
Management Plan for Northern Biodiversity Area	26/06/2017 (DP&E)
Management Plan for North Rothbury Biodiversity Area	30/04/2018 (DP&E)
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)

TABLE 3.8 MOP APPROVAL STATUS FOR MOUNT THORLEY WARKWORTH

Mining Operations Plan	Date Submitted	Date Approved
Mount Thorley Warkworth MOP Amendment A 2018 - 2021	11/10/2018	14/12/2018
Mount Thorley Warkworth MOP Amendment B 2018 - 2021	23/5/2019	11/6/2019
Mount Thorley Warkworth MOP Amendment C 2020 - 2021	31/3/2020	24/11/2020

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 3** illustrates the mining process. MTW have no active underground workings.

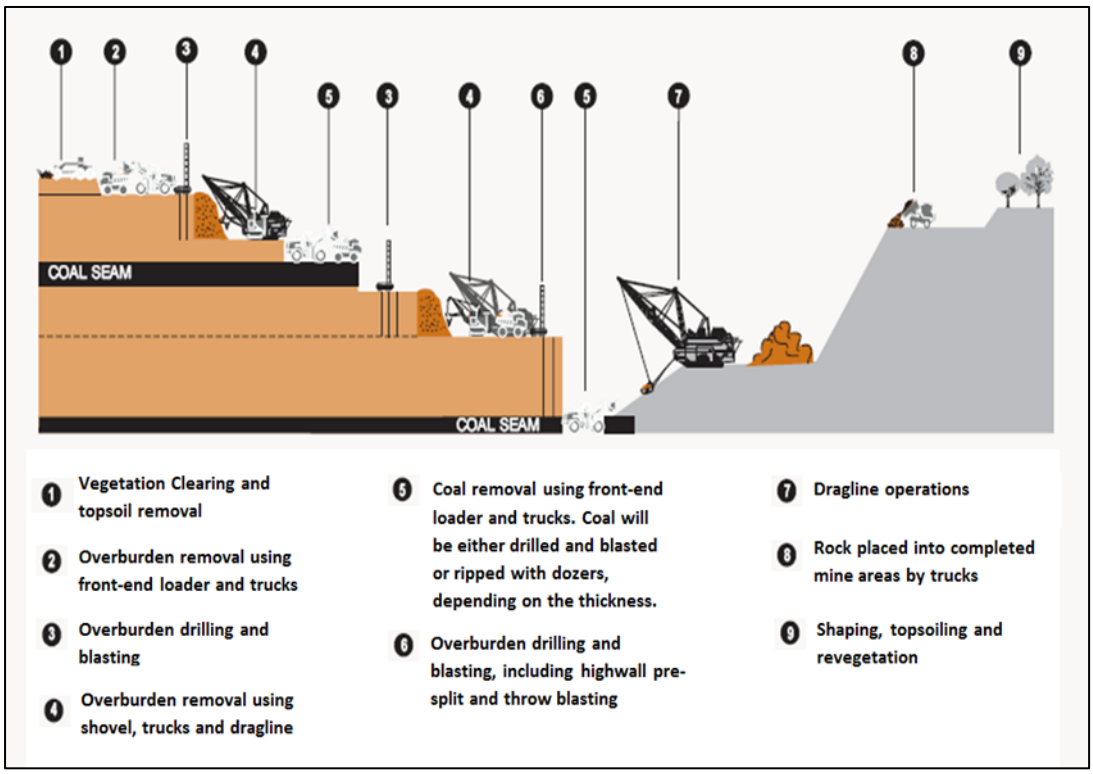


FIGURE 3: MINING PROCESS

Within Warkworth, mining activities will continue to advance in a westerly direction in both North and West Pits. South Pit has reached its final limit with regards to excavation and is available for dumping activities. Within Mount Thorley, two small areas in the northern and southwestern extents of the mining lease reached their final limits during 2020. Mount Thorley will now be utilised for 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 MOP.

The planned 2021 production and waste schedule for MTW is summarised below:

- 18.0 Mt ROM coal;
- 12.25 Mt Product coal;
- 112 Mbcm overburden (including rehandle)
- 5.7 Mt Tailings and reject

The forecasted ROM coal production represents approximately 65% of the approved maximum ROM coal production for MTW. Coal will continue to be transported via conveyer to the Mount Thorley Coal Loader and railed to the port.

4.2 Mineral Processing

All processing and rejects/tailings disposal activities undertaken in 2020 were consistent with the approved MOP and no changes were made to the processing and rejects/tailings disposal methods.

Active tailing emplacements included the Centre Ramp Tailings Storage Facility, Abbey Green South Tailings Storage Facility and Ministrip Tailings Storage Facility. Tailings Dam 2 was previously used to receive ash from Redbank Power Station but ceased in July 2014 following the cessation of operations at Redbank Power Station. During 2020 capping works on Tailings Dam 2 and the Interim Tailings Storage Facility continued. The Loders Pit Tailings Storage Facility was developed during 2020 and tailings deposition commenced into this facility in January 2021.

4.3 Production Statistics

MTW is permitted to extract up to 28 Mtpa of ROM coal, comprising 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 2020

Material	Approved Limits	Reporting Period 2019	Reporting Period 2020	Forecast for 2021
Prime Overburden Waste (kbcm)	N/A	96,765	98,217	103,543
MTO ROM Coal (Mtpa)	10 (SSD-6465)	0.71	0.88	0.20
WML ROM Coal (Mtpa)	18 (SSD-6464)	16.90	16.60	17.80
ROM Coal (Mtpa)	28 (Combined)	17.61	17.49	17.99
Coarse Reject (kt)	N/A	4,236	5,063	5,172
Fine Reject – Tailings (kt)	N/A	1,196	1,116	577
Product (kt)	N/A	12,000	11,929	12.25

All product coal was transported by rail. MTW transported 11,839 kt of product coal via rail during the 2020 reporting period.

4.4 Summary of Changes (Developments and Equipment Upgrades)

- No significant changes from 2019 to 2020 to the mining fleet

5 ACTION(S) REQUIRED FROM PREVIOUS ENVIRONMENTAL MANAGEMENT REVIEW

An annual environmental inspection was not undertaken by DPI&E in 2020 and there were no actions required by DPI&E to be addressed in the 2020 AER.

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 real time 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 (2011). 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: http://insite.yancoal.com.au.

6.2 Noise

6.2.1 Noise Management

MTW manages noise 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 for viewing via the MTW website: http://insite.yancoal.com.au.

MTW's 2020 noise performance metrics are shown below:

- Community noise complaints received – reduced by ~12% from 2019
- Number of Community Response Officer (CRO) (supplementary) noise measurements which exceed the internal trigger level for action – decreased to 72 from 94 in 2019; and
- Number of equipment downtime hours logged in response to noise management triggers – decreased by ~ 10% from 2019.

A range of noise management processes were undertaken during 2020. These are described herein.

6.2.1.1 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 2020 is presented in **Table 6.1**.

MTW's 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. Viewer access: http://insite.yancoal.com.au

TABLE 6.1 SUMMARY OF SUPPLEMENTARY ATTENDED NOISE MONITORING CONDUCTED BY COMMUNITY RESPONSE OFFICERS 2020

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)	1307	42	12	33.25	32.58
Bulga Village	622	4	0	32.53	31.98
Inlet Road	521	10	0	32.65	31.86
Inlet Road West	374	0	0	29.93	29.41
Long Point	998	0	0	31.01	-
South Bulga	0	-	-	-	-
Wambo Road	120	4	-	34.91	32.70
Total	3943	60	12	-	-

^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. A compliance assessment is provided in Sections 6.2.2 and 6.2.2.1.

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

In response to the events listed in **Table 6.1** which were greater than the trigger, up to 1090 hours of equipment downtime were recorded to manage noise during 2020. This is a decrease (approximately 10%) to the number of downtime hours recorded in 2019 coinciding with a decrease in the number of supplementary noise measurements completed which exceed the trigger for management action.

6.2.2 Noise Performance

A total of 96 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 presented in the Monthly Environmental Monitoring Reports, available via the MTW website https://insite.yancoal.com.au/document-library/monthly-reporting-mtw

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 no noise measurements taken during the reporting period which required the penalty to be applied.

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)
N/A	-	-	-	-	-	-

6.2.2.1 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 demonstrates a continuation of the effective management delivered in 2020.

TABLE 6.3 COMPARISON OF 2020 NOISE MONITORING RESULTS AGAINST PREVIOUS YEARS'

Year	Number of assessments	Number of exceedances	Number of non-compliances
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 2020, 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))*	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Wollemi Peak Road (Bulga RFS)	1072	1307	41	42	13	12	33.4	33.3	32.9	32.6
Bulga Village	651	622	3	4	-	0	32.4	32.5	31.1	32.0
Inlet Road	671	521	27	10	1	0	33.4	32.7	32.4	31.9
Inlet Road West	407	374	-	0	-	0	30.1	29.9	27.7	29.4
Long Point	1133	998	5	0	-	0	31.1	31.0	30.6	-
South Bulga	0	0	-	-	-	-	-	-	-	-
Wambo Road	305	120	4	4	-	-	33.5	34.9	31.7	32.7
Total	4239	3943	80	60	14	12	-	-	-	-

^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.*

6.2.2.2 Validation of Real Time Monitoring Results

A comparison of real time and independent attended noise monitoring results was undertaken for quarter four 2020. The comparison identified that the attended noise monitoring results were generally lower than the corresponding real time noise monitoring results i.e. real time noise monitor trigger is mainly conservative for the most closely located real time noise monitor and for the mostly closely aligned 15-minute monitoring periods. There were isolated exceptions to this, including;

- WML LAeq 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 October and December.
- MTO LAeq, 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 October.

On the occasions where the WML and MTO attended monitoring measured noise levels were higher, the recorded noise levels were significantly below noise limits specified in MTW's Noise Management Plan. The 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 are exceeding the specified noise limit(s).

6.2.2.3 Comparison against EA Predictions

Table 6.5 provides a comparison of 2020 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 3 of the development (nominally 2017). The comparison data has been sourced from the modelled noise levels at the nearest residential receivers to the current monitoring locations. Reported 2020 data is the calculated quarterly average of WML contribution to measured LAeq (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 LAeq average for the quarter. The comparison shows that measured noise is within the predicted noise level range.

TABLE 6.5 PREDICTED NIGHT TIME WML (EIS 2014) LAEQ (15 MINUTE) NOISE LEVELS AND AVERAGED AND MAXIMUM 2020 MONITORING RESULTS

Monitoring Location	Year 3 Modelled Noise	Quarter 1 2020 average & maximum		Quarter 2 2020 average & maximum		Quarter 3 2020 average & maximum		Quarter 4 2020 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	27.0	31	25.0	30	29.7	34	29.7	34
Bulga Village	≤38	26.7	30	25.7	27	27.7	36	29.3	33
Gouldsville Road	≤35	29.3	30	27.3	32	28.3	35	29.0	30
Inlet Road	≤37	25.0	25	25.0	25	30.3	34	28.7	31
Inlet Road West*	≤35	25.0	25	25.0	25	26.3	34	23.3	25
Long Point*	≤35	21.7	25	25.0	25	25.0	25	26.0	28
South Bulga	≤38	25.0	25	26.7	30	26.7	30	25.0	25
Wambo Road	≤38	26.3	29	25.0	25	29.0	33	27.3	32

**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 2020 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 on **Figure 4** below.

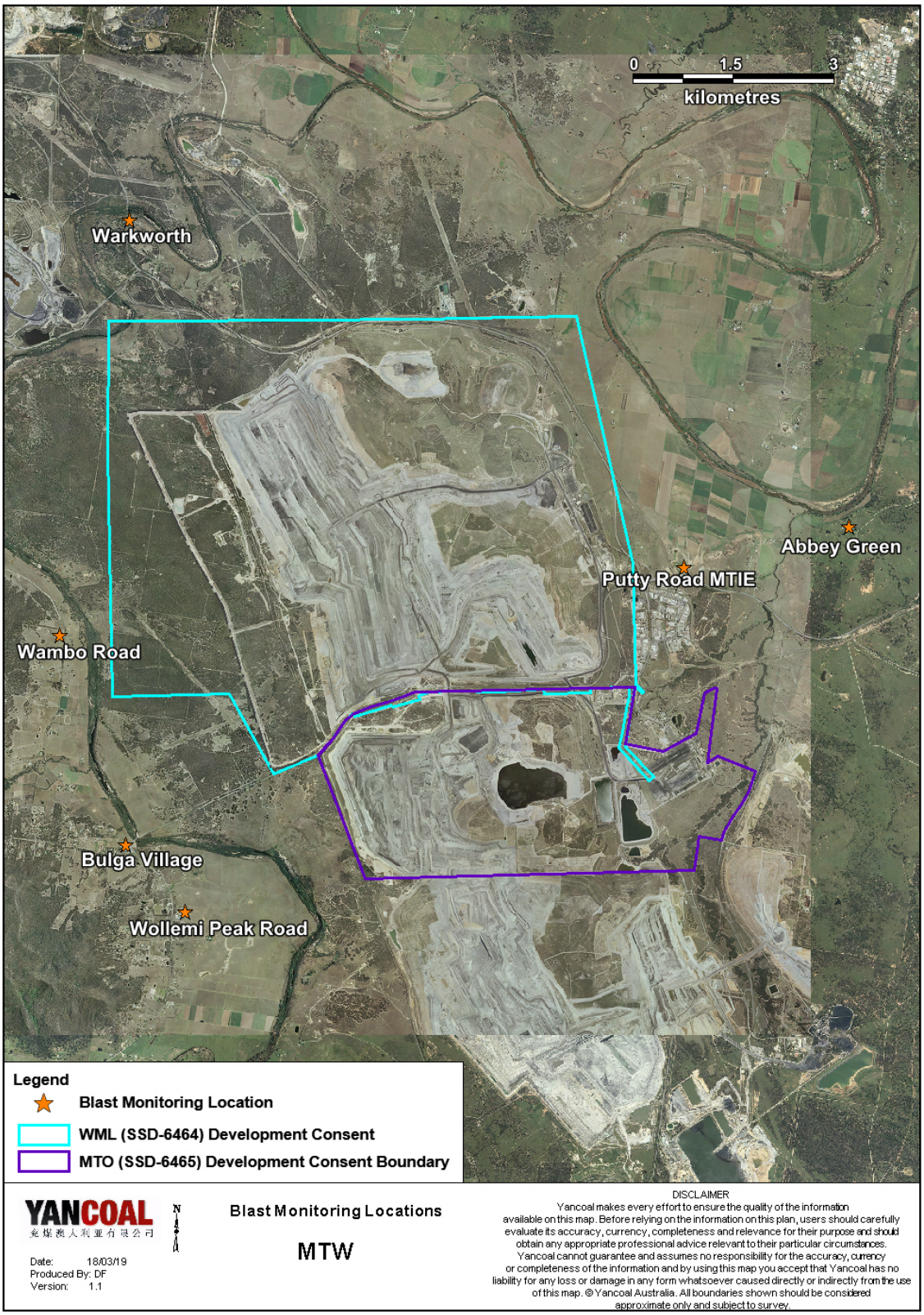


FIGURE 4: BLAST MONITORING LOCATIONS

6.3.2 Blast Performance

During the reporting period 221 blast events were initiated at MTW. Results of ground vibration and airblast overpressure recorded during 2020 are presented in **Figure 5** to **Figure 10**. All blasts returned results below the relevant airblast overpressure / ground vibration criteria for all monitoring locations.

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 dust or when blast fume management zones encompassed public roads.

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).

In accordance with Schedule 3, Conditions 7 and 8 of SSD-6465, Mt Thorley Operations Limited carried out blasting on site between 7am and 5pm Monday to Saturday inclusive. No blasts occurred on Sundays or on public holidays. Mt Thorley Operations carried out not more than 2 blasts per day and not more than 6 blasts per week (averaged over a calendar year).

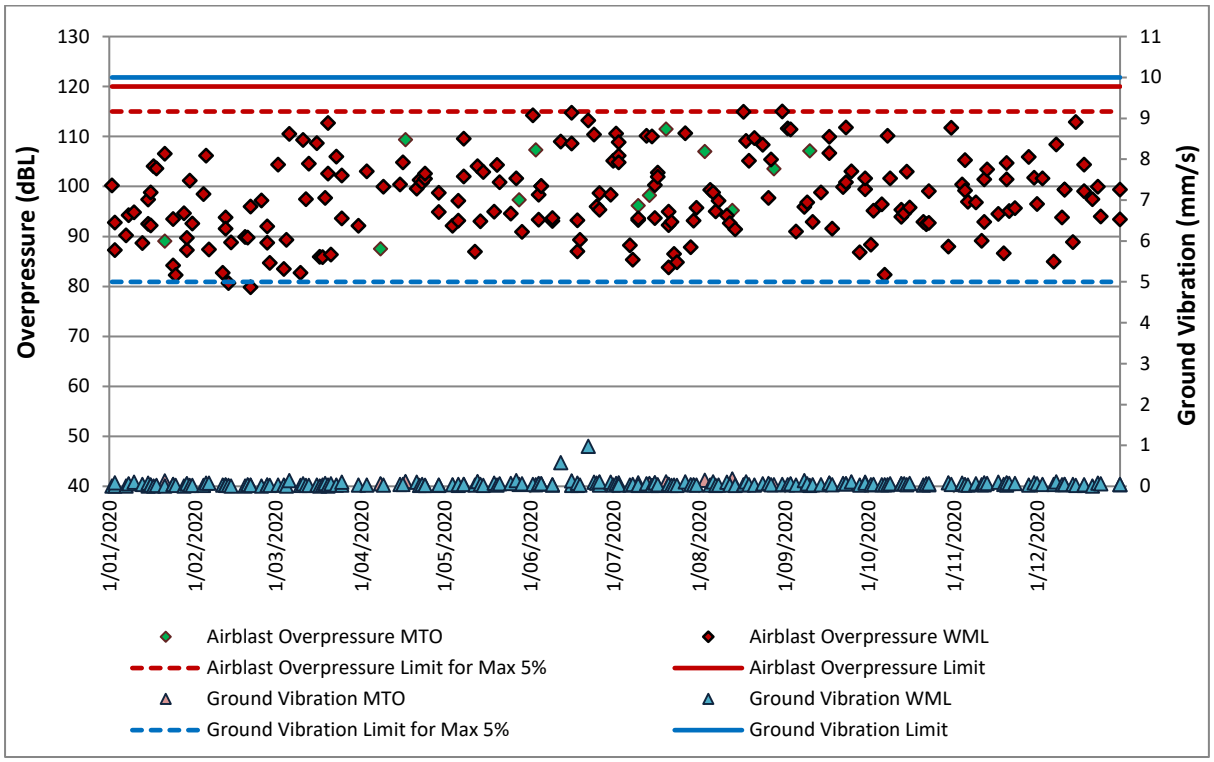


FIGURE 5: ABBEY GREEN BLAST RESULTS

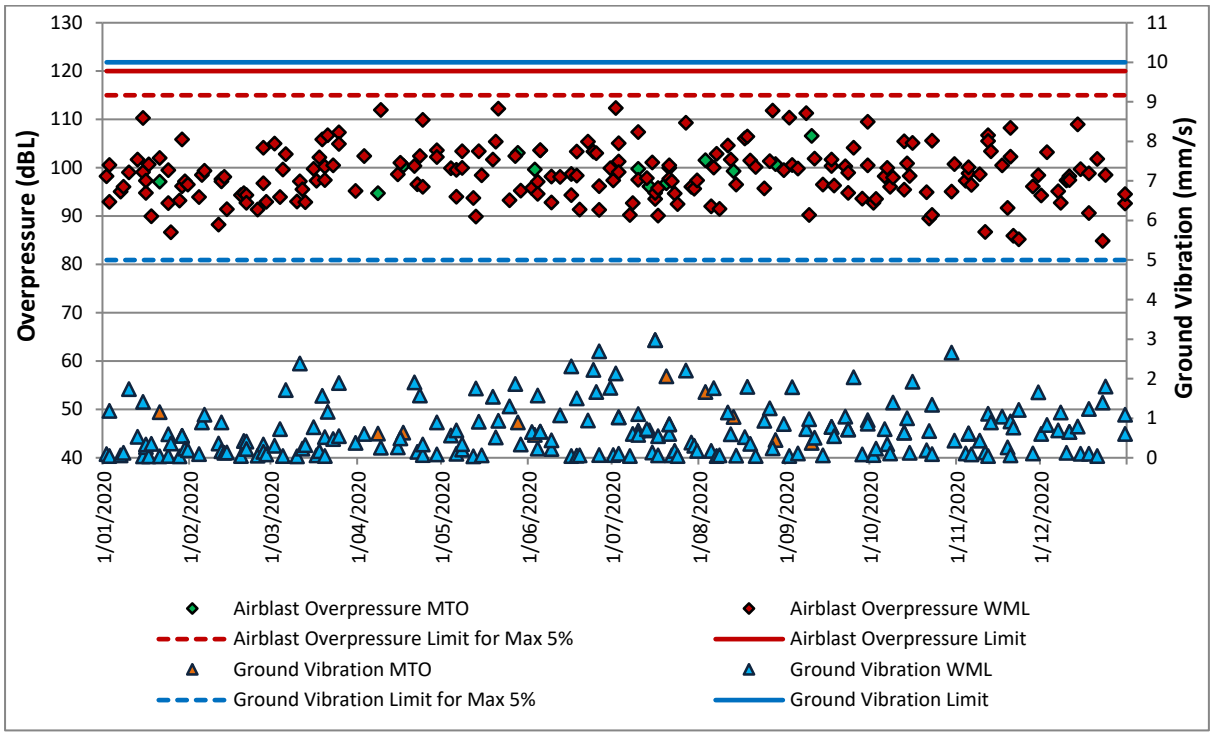


FIGURE 6: BULGA VILLAGE BLAST RESULTS

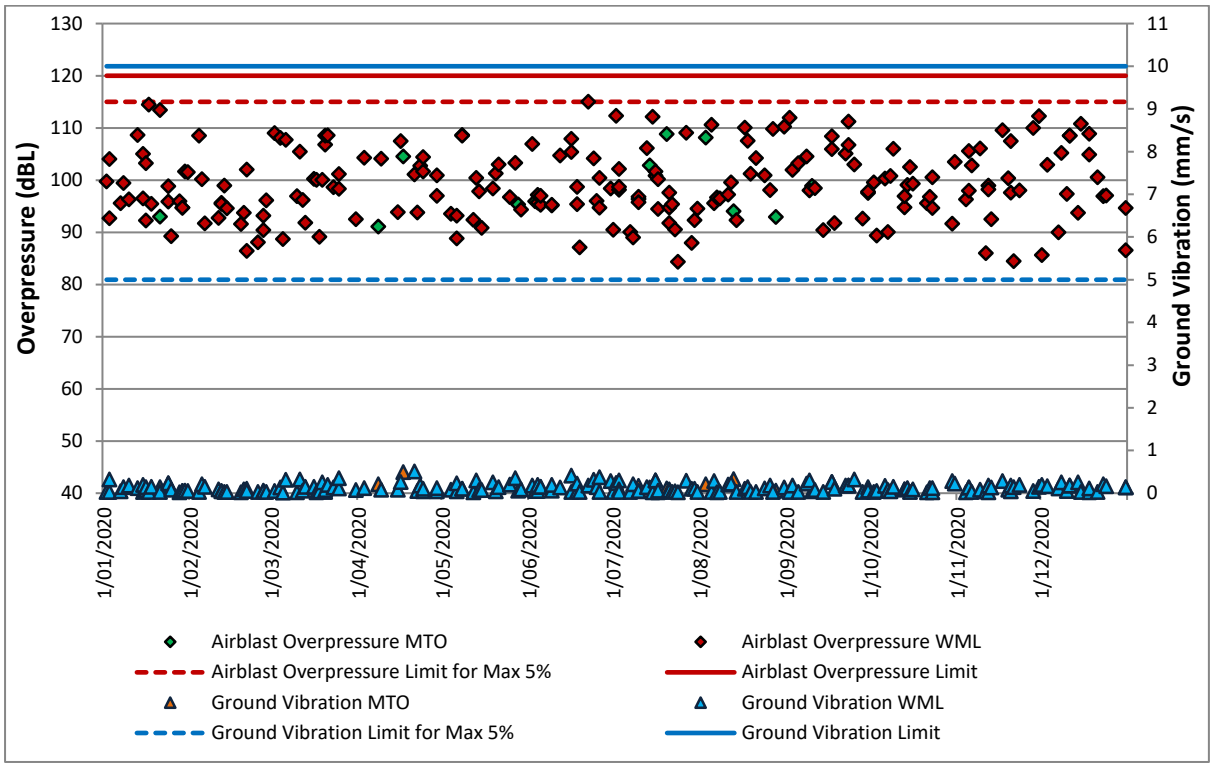


FIGURE 7: MTIE BLAST RESULTS

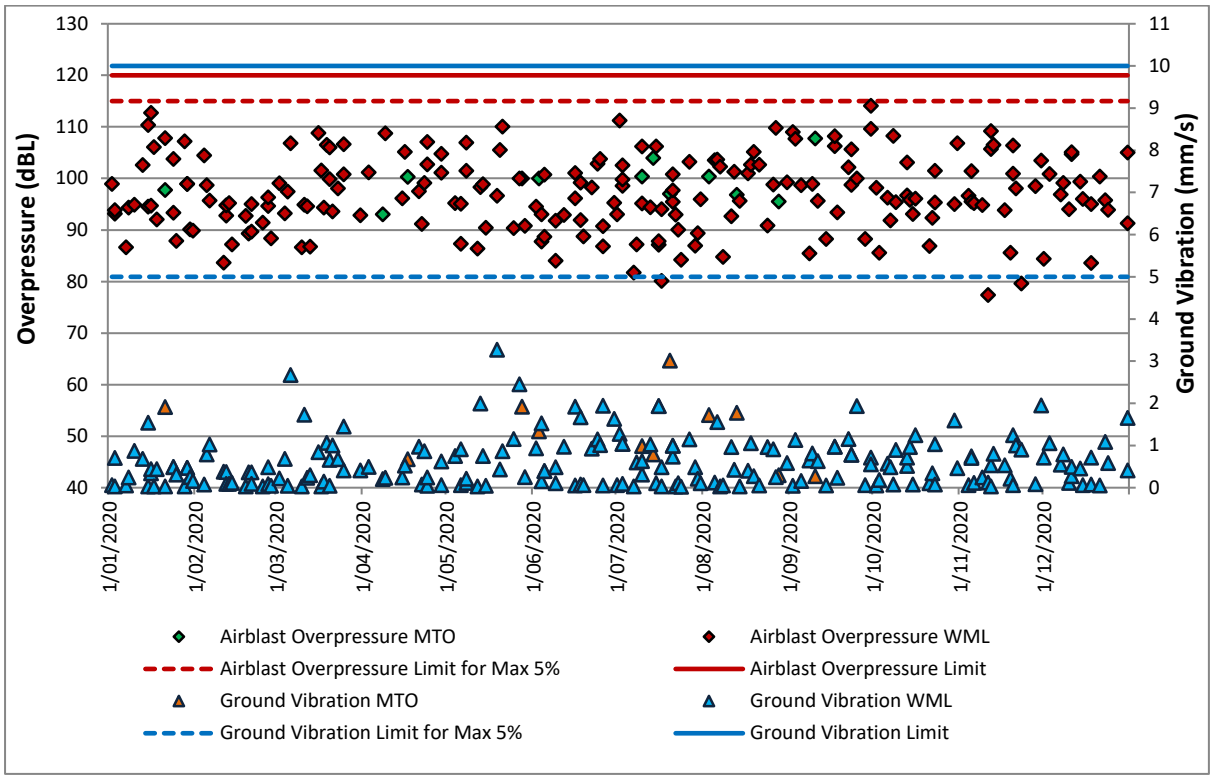


FIGURE 8: WOLLEMI PEAK ROAD BULGA BLAST RESULTS

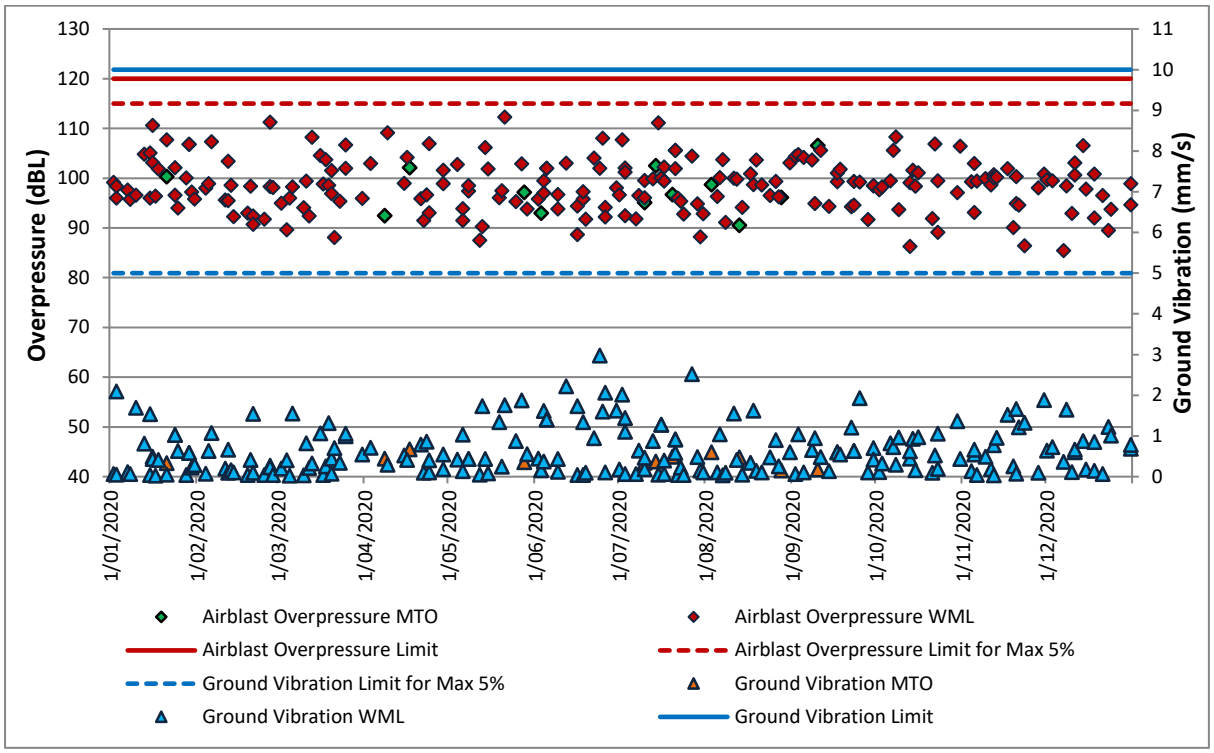


FIGURE 9: WAMBO ROAD BLAST RESULTS

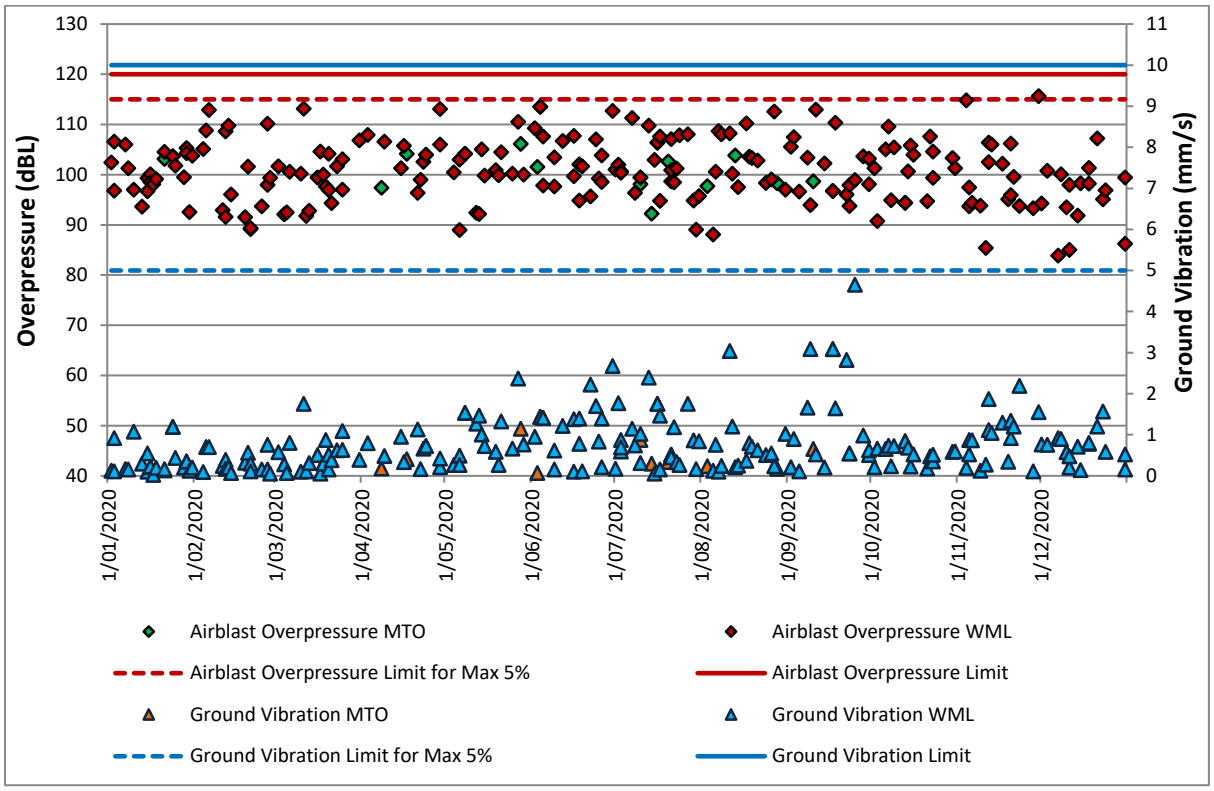


FIGURE 10: WARKWORTH BLAST RESULTS

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 2020, no blasts produced visible post-blast fume with a post-blast ranking Level 3 or higher according to the AEISG Scale.

Rankings for visible blast fume according to the AEISG scale for shots fired during 2020 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	2020	2019	2018
0	243	269	280
1	13	16	26
2	9	7	15
3	0	1	2
4	0	0	0
5	0	0	0
Total*	265	293	323

** 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 2020 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 http://insite.yancoal.com.au), 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.

2,566 real-time alarms for air quality and wind conditions were received and acknowledged during 2020. In response, **1,526** hours of 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 11**.

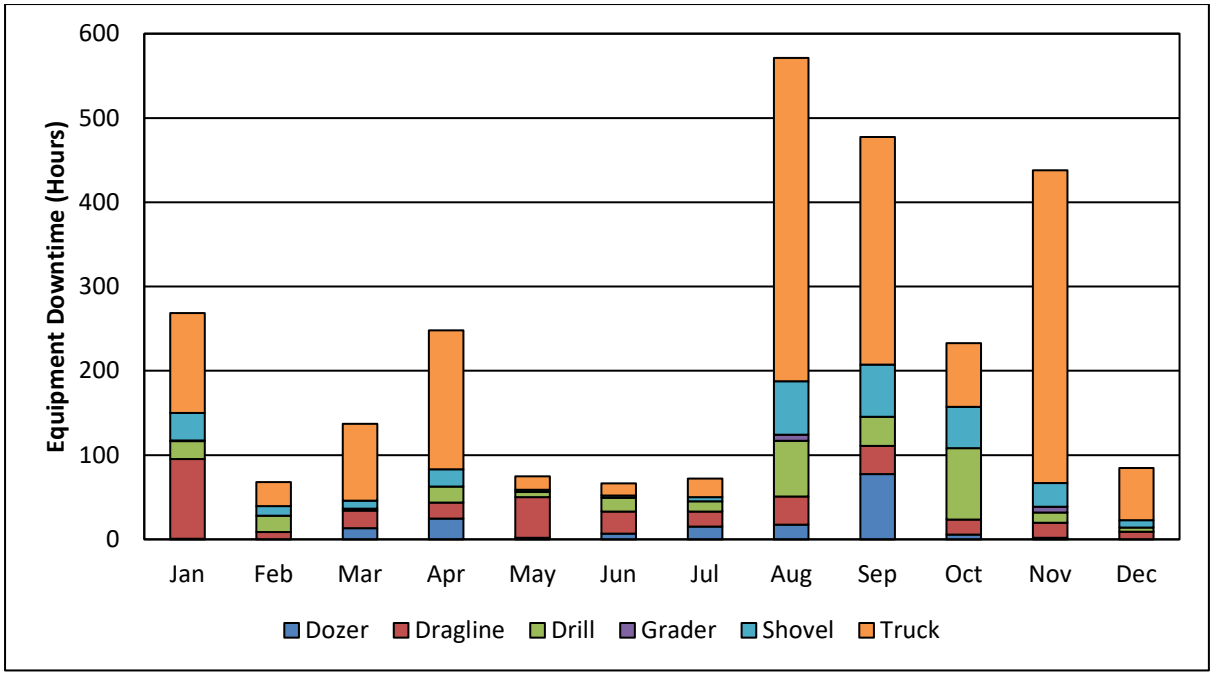


FIGURE 11: EQUIPMENT DOWNTIME FOR DUST MANAGEMENT BY MONTH (2020)

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 12**. During 2020, 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 Report and daily data can be accessed on http://insite.yancoal.com.au

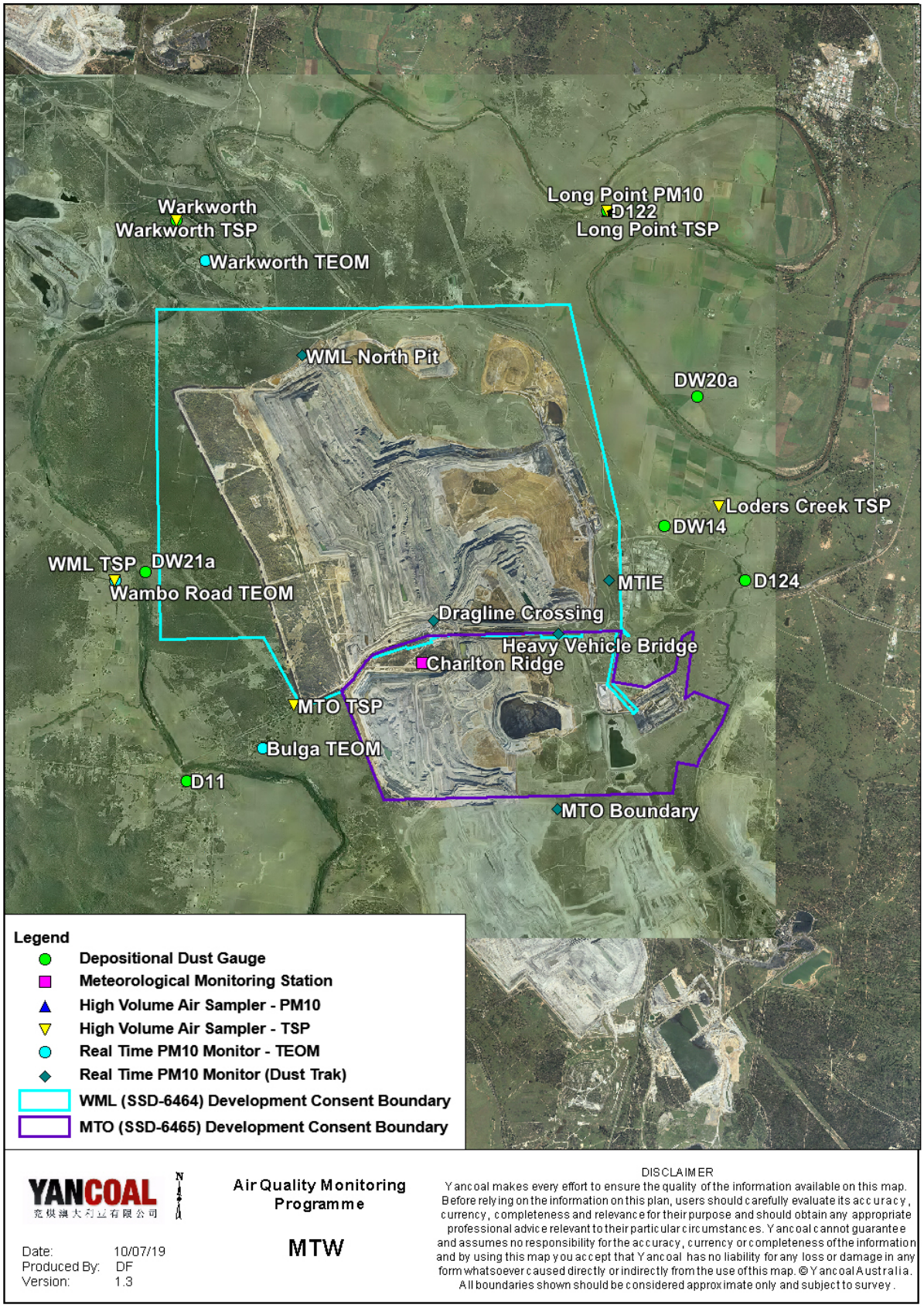


FIGURE 12: AIR AND METEOROLOGICAL MONITORING LOCATIONS MTW 2020

TABLE 6.7 AIR QUALITY IMPACT ASSESSMENT CRITERIA AND 2020 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 at seven (7) locations situated on, or representative of privately-owned land generally in accordance with AS3580.10.1 (2003). The annual average insoluble matter deposition rates in 2020 compared with the impact assessment criterion and previous years' data is shown in **Figure 13.**

There was one exceedance of the 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 not more than 1.3g/m2/month, or 24% of the total level of 5.5g/m2/month at Warkworth. As per MTW's approved Air Quality Management Plan, this does not constitute non-compliance because the exceedance is not attributable to either of WML or MTO and no further action is required.

After analysis of the single exceedance, all annual average insoluble matter deposition rates recorded on privately owned land were compliant with the long-term impact assessment criteria of 4g/m2/month. All monitoring locations also demonstrated compliance with the maximum allowable insoluble solids increase criteria of 2g/m2/month (**Figure 14**).

It should be noted that during 2020, monthly dust deposition rates equal to or greater than the long-term impact assessment criteria of 4g/m2/month were recorded at multiple sites. Where field observations denote a sample as contaminated (typically with insects, bird droppings or vegetation), the results are excluded from Annual Average compliance assessment. Meteorological conditions and the results of nearby monitors for the sampling period are also considered when determining MTW's level of contribution to any elevated result. Details of excluded results are presented in the relevant MTW Monthly Environmental Monitoring Report. The graphs below illustrate a general trend in decreased Depositional Dust in 2020 compared to 2019, except for the Warkworth and D122 monitoring locations. This is consistent with above average rainfall recorded in 2020 (828 mm), compared to below average rainfall totals in 2018 (457 mm) and 2019 (304 mm).

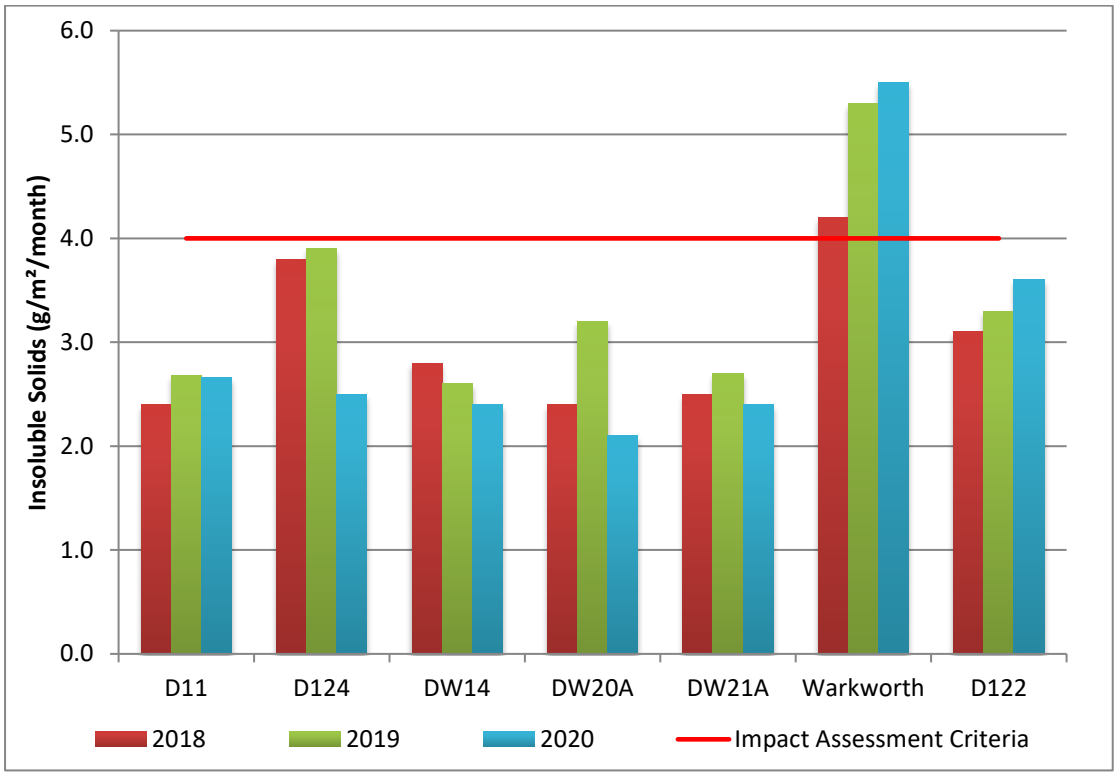


FIGURE 13: 2020 DEPOSITIONAL DUST RESULTS COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA AND PREVIOUS YEARS' RESULTS

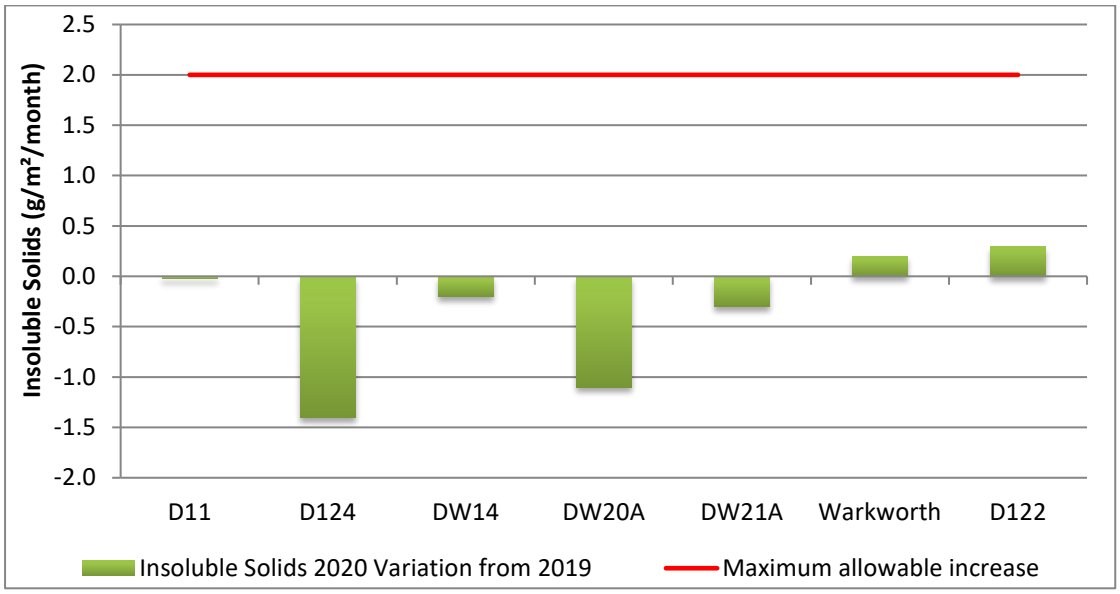


FIGURE 14: VARIATION IN INSOLUBLE SOLIDS DEPOSITION RATE FROM 2019 TO 2020 COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA

6.4.2.3 Total Suspended Particulates (TSP)

Total Suspended Particulates (TSP) are measured at five (5) locations situated on or representative of privately owned land in accordance with AS3580.9.3 (2003). Annual average TSP concentrations recorded in 2020 compared against the long-term impact assessment criterion and previous years' data, are shown **Figure 15**.

All annual average results were compliant with the impact assessment and land acquisition criteria.

During the reporting period, four (4) 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) likely due to power failures.

The annual average TSP concentrations recorded in 2020 are lower than those recorded in previous years, which is likely related to above average rainfall for the year.

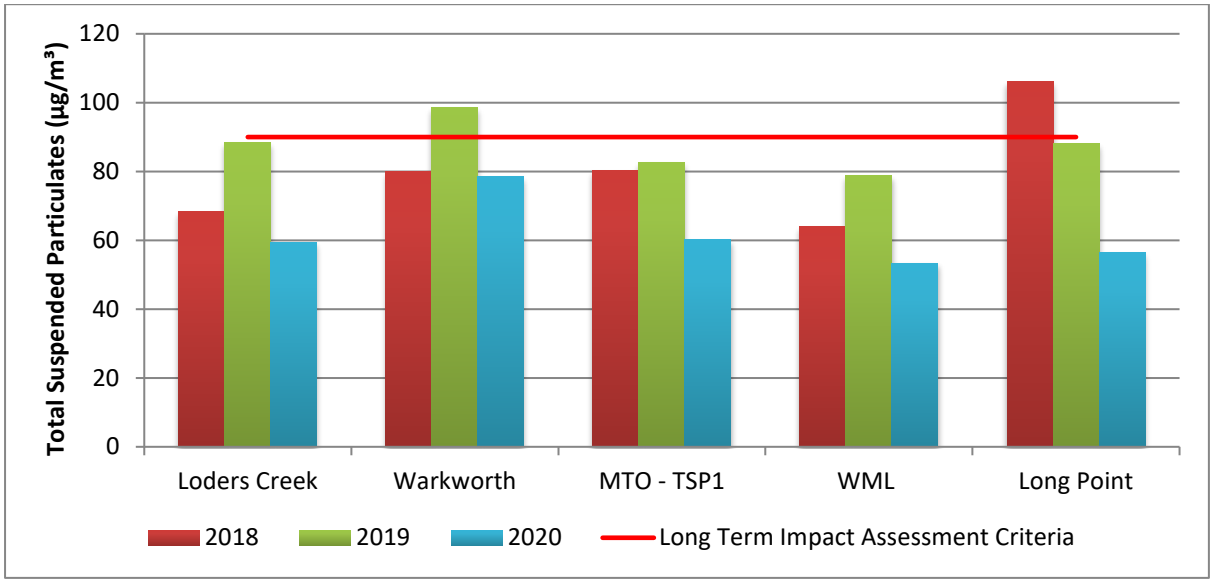


FIGURE 15: 2020 TSP ANNUAL AVERAGE COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA AND PREVIOUS YEARS' RESULTS

6.4.2.4 Particulate Matter <10µm (PM10)

Compliance assessment for Particulate Matter <10µm (PM_{10}) is measured at five (5) locations on privately owned land in accordance with AS3580.9.6 (2003). During 2020, all short term and annual average results were compliant with the impact assessment criteria.

6.4.2.5 Short term PM10 impact assessment criteria

Monitoring results for PM_{10} (24 hour) collected through the High-Volume Air Sampler monitoring network are compared against the short-term impact assessment criteria (**Figure 16**). All 24hr average

results recorded by MTW's surrounding network of TEOM monitors are presented on a quarterly basis in **Figure 17** to **Figure 20.**

The figures show that levels were elevated in January. The elevated levels were primarily caused by smoke from bushfires which impacted the east coast of NSW at the end of 2019 and into early 2020, as well as generally elevated PM10 levels associated with hot, dry and windy days during drought conditions.

The DPIE provided MTW with a list of dates of "extraordinary events" for 2020 for the Upper Hunter, as shown in **Table 6.9** below. Extraordinary events include bushfires, dust storms and/or regional dust events. As per MTW's Development Consents, the short and long term impact assessment criteria do not apply on days declared as extraordinary events.

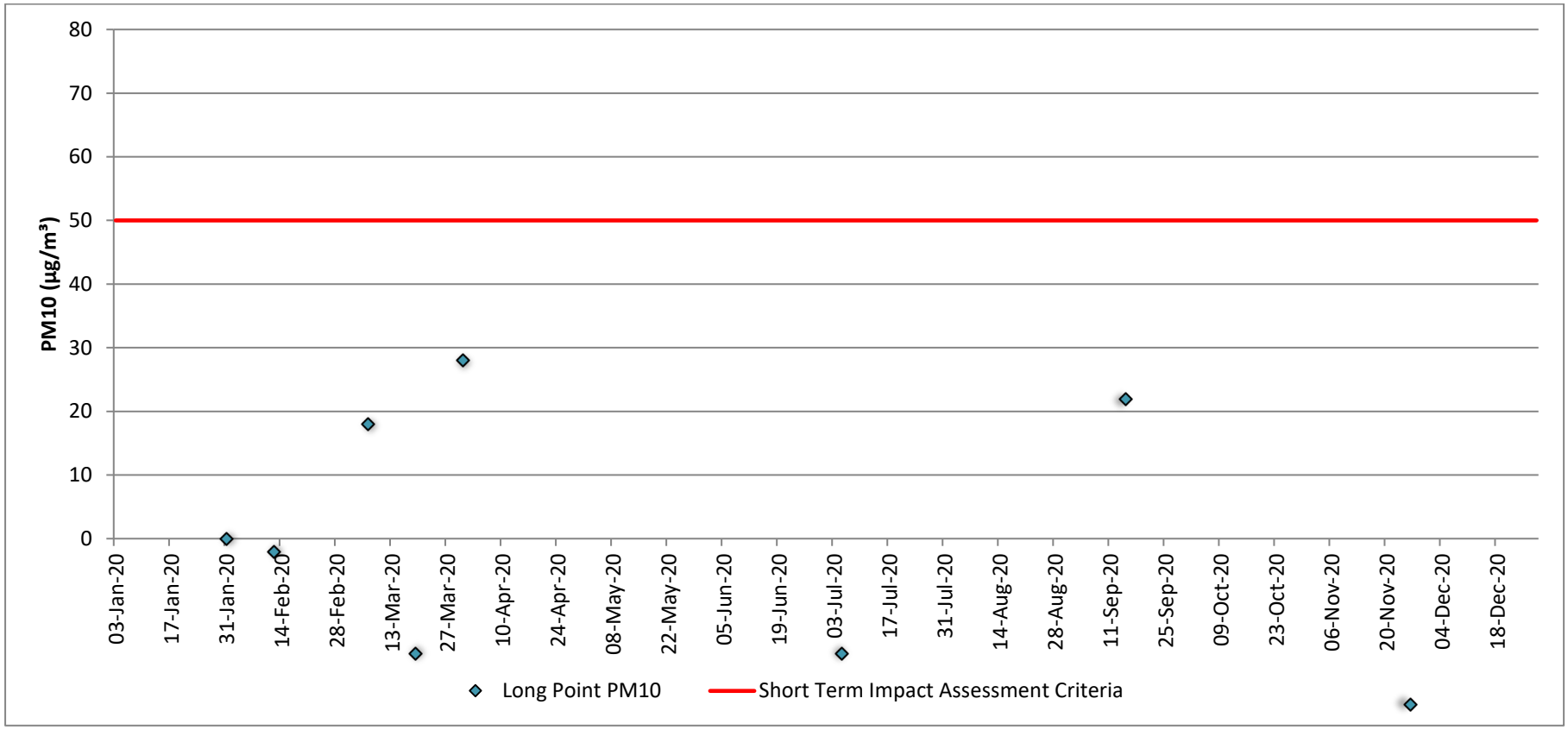


FIGURE 16: PM10 24HR MONITORING RESULTS (MEASURED BY MTW PM10 HVAS MONITOR)

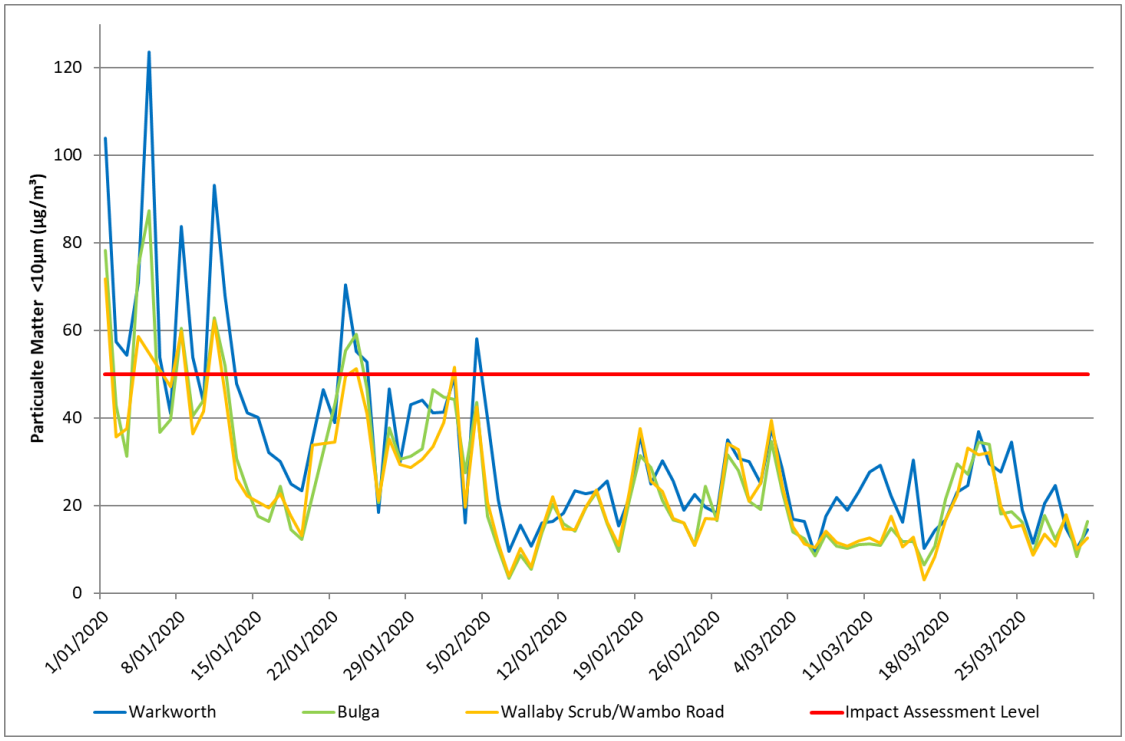


FIGURE 17: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER ONE 2020

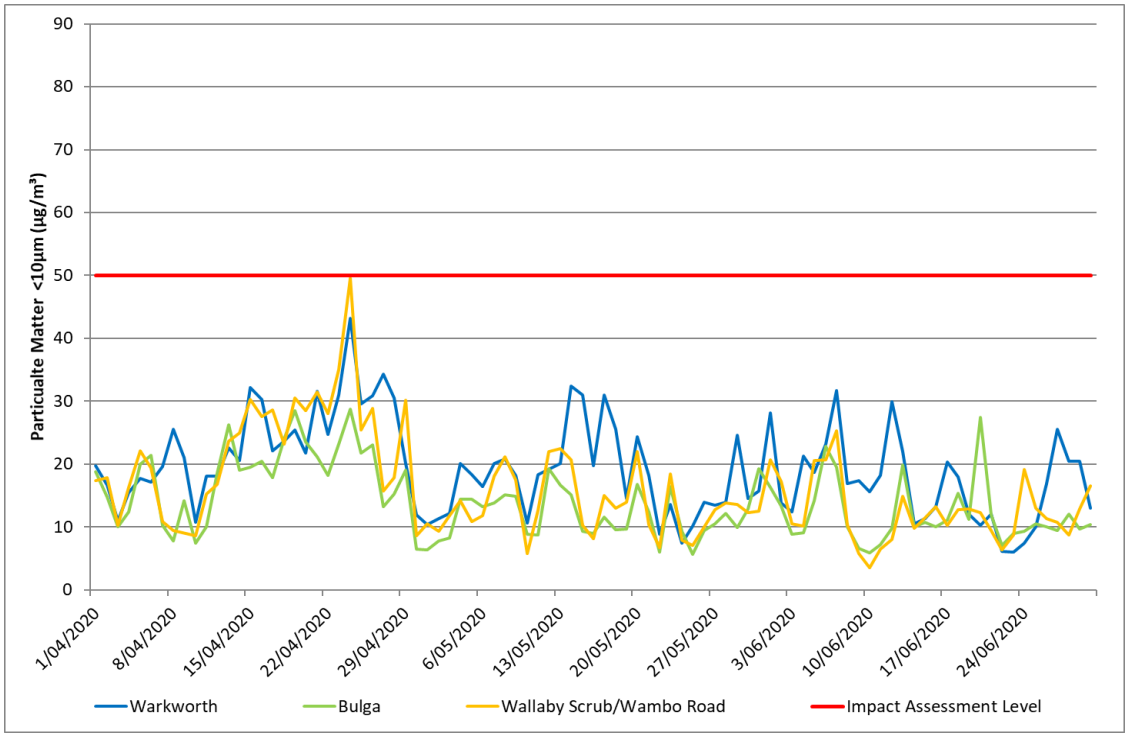


FIGURE 18: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER TWO 2020

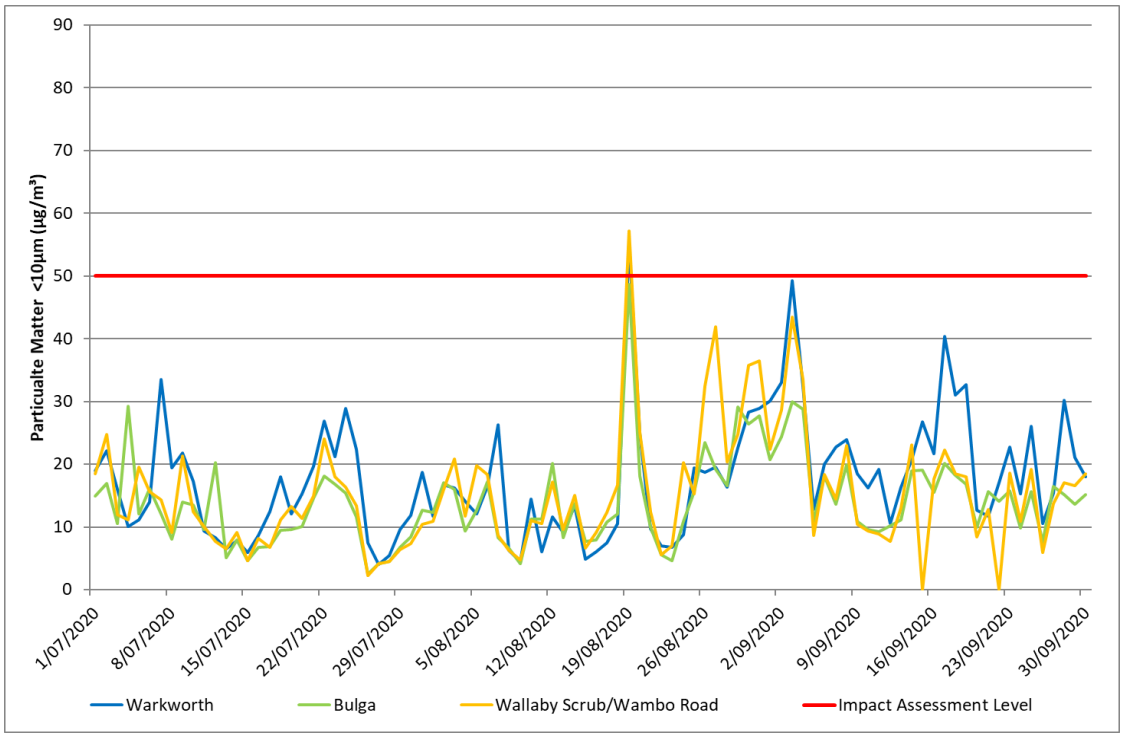


FIGURE 19: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER THREE 2020

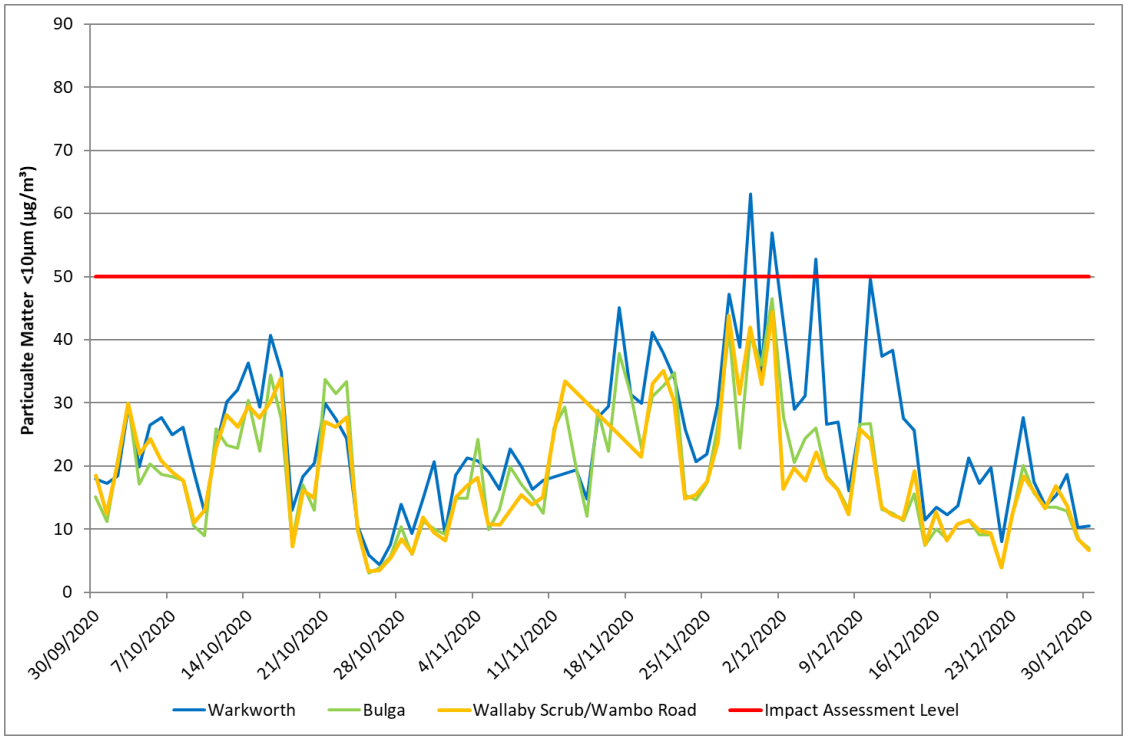


FIGURE 20: 24HR AVERAGE PM_{10} MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER FOUR 2020

TABLE 6.8 EXTRAORDINARY EVENT DAYS

Month	Day(s)
Jan	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 20, 21, 23, 24, 25
Feb	1, 2, 4, 19
Mar	-
Apr	-
May	-
Jun	-
Jul	-
Aug	19
Sep	-
Oct	-
Nov	29
Dec	-

Excluding "extraordinary event" days, one high volume air sample and two TEOM PM_{10} measurement results potentially 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. MTW was not a significant contributor to the exceedances and therefore no non-compliances were recorded.

A summary of the investigations undertaken for each short term PM10 exceedance are provided in **Table 6.10**

TABLE 6.9 24 HOUR PM_{10} INVESTIGATIONS - 2020

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Estimated contribution from MTW ($\mu g/m^3$)	Discussion
01/12/2020	Warkworth TEOM	56.9	29.5	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 29.5µg/m3 or ~52% 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 ($\mu g/m^3$)	Estimated contribution from MTW ($\mu g/m^3$)	Discussion
26/04/2020	Long Point HVAS PM_{10}	53.0	29.9	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 29.9µg/m3 or ~56% 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.
05/12/2020	Warkworth TEOM	52.8	26.8	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 26.8µg/m3 or ~51% 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.

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 (**Figure 21**). 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 Bulga, Wallaby Scrub Road and Warkworth monitoring locations recorded decreases in annual average PM_{10} concentrations compared to 2019. This decrease is considered largely attributable to above average rainfall after three preceding years of below average rainfall.

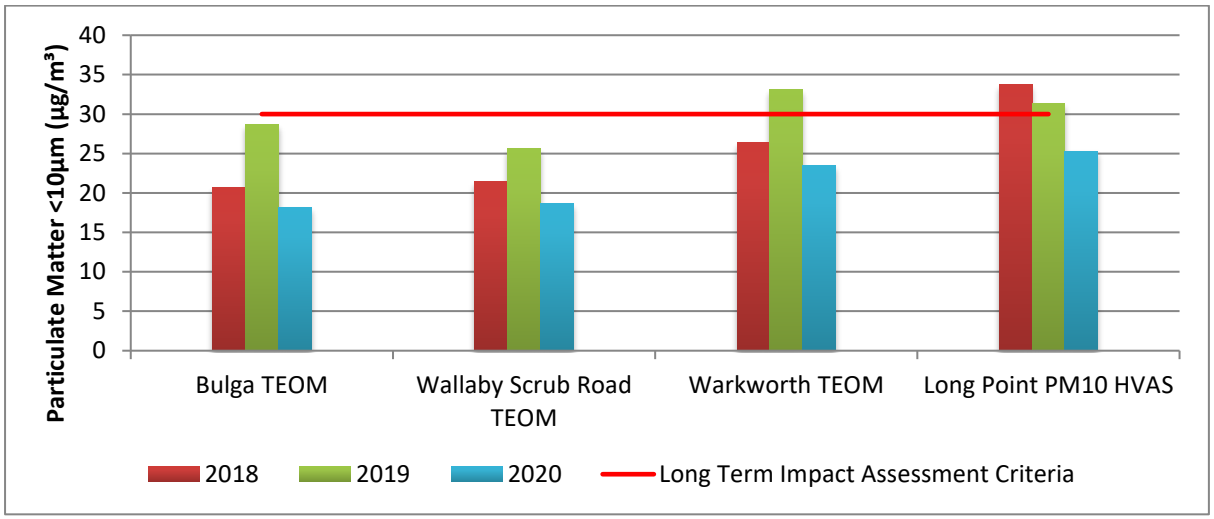


FIGURE 21: ANNUAL AVERAGE PM10 RESULTS 2018 TO 2020

6.4.2.7 Comparison of 2020 Air Quality data against EA predictions

Annual average PM_{10} results were partially below and partially above the modelled range for Year 3 of the development (nominally 2017) which is the mine plan year in the EA which provides the most appropriate comparison year. Refer to **Table 6.12**

TSP annual averages at all monitoring locations were higher than modelled predictions for the Year 3 scenario. Refer to **Table 6.13.**

The difference between modelled predictions and the measured results can be explained as a function of model inputs which do not account for PM_{10} or TSP contribution from regional particulate events such as bushfires, stock movement, dust from local roads and driveways and agricultural activity.

TABLE 6.10 2020 PM10 ANNUAL AVERAGE RESULTS COMPARED AGAINST CUMULATIVE PREDICTIONS FOR YEARS 3 - WARKWORTH CONTINUATION EIS (2014).

Monitoring Location	Long Term (annual average) PM_{10} criteria	
	Year 3 EIS Prediction (µg/m³)	2020 Annual Average (µg/m³)
Bulga OEH TEOM	23	18.1
Wallaby Scrub Road TEOM	16	18.7
Warkworth OEH TEOM	30	23.5
Long Point PM_{10}	16	25.3

TABLE 6.11 2020 TSP ANNUAL AVERAGE RESULTS COMPARED AGAINST CUMULATIVE PREDICTIONS FOR YEAR 3 – WARKWORTH CONTINUATION EIS (2014).

Monitoring Location	Long Term (annual average) TSP criteria	
	Year 3 EIS Prediction (µg/m^3)	2020 Annual Average (µg/m^3)
MTO TSP1	52	60.1
Loders Creek TSP	43	59.5
WML- HV2a	39	53.4
Warkworth	65	78.5
Long Point	38	56.5

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

No Aboriginal cultural heritage assessments or salvage programs were required at MTW during the reporting period. 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).

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.

There was one additional Aboriginal cultural heritage site identified during the reporting period. The site was identified by an MTW employee as part of the due diligence process associated with MTW's ground disturbance approvals process. The site was barricaded and MTW arranged for an inspection by a qualified archaeologist to record and document the site. An AHIMS site card was developed and submitted in accordance with the provisions outlined in the AHMP and the site was added to the MTW cultural heritage management GIS layer.

An AHMP compliance inspection covering the 2020 reporting period was undertaken on 22-23 December 2020. This inspection was conducted by representatives of the Aboriginal community, internal MTW personnel and a consultant archaeologist. A total of 39 Aboriginal cultural heritage sites were reviewed during this program, with no adverse findings identified. The Aboriginal Heritage Management Plan Inspection report is shown in **Appendix 1**.

The Upper Hunter Valley 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. There were no meetings of the CHWG during the reporting period. Further consultation with the CHWG is planned for the next reporting period to discuss upcoming salvage programs and general cultural heritage management processes.

6.5.2.1.2 Audits and Incidents

During the reporting period there were 40 Ground Disturbance Permits (GDP's) 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 2020.

An Independent Environmental Audit was conducted during 2020 that identified several cultural heritage management recommendations to be actioned by the site. These actions have been completed during the 2020 reporting period, namely:

- Finalisation of reports for salvages conducted in June 2017 and February 2018;
- Relocation of Aboriginal objects from HVO as per new Care Agreement; and
- Development of a project schedule and budget to progress management recommendations outlined in the HHMP and site-specific CMPs.

6.5.2.2 Historic Heritage

6.5.2.2.1 Historic Heritage Activities

MTW completed an aerial drone review of the three historical heritage sites during the 2020 reporting period to help inform ongoing management activities. Termite management was also implemented during the 2020 reporting period.

An Historic Heritage Management Plan (HHMP) compliance inspection covering the 2020 reporting period was conducted on 21 December 2020. This inspection was conducted by a consultant archaeologist, assisted by representatives of the Community Heritage Advisory Group (CHAG) and internal MTW personnel. A total of 3 historic heritage sites were inspected during this program. The Historic Heritage Management Plan Inspection Report is shown in **Appendix 2**.

In 2012 the 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 particular 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. Singleton Council advised correspondence received September 2020, that a total of 3 applications were made in 2020. Council in consultation with their consultant Heritage Advisor reviewed the 3 applications which indicated there were two conforming applications, and one non-conforming application. Conforming applications were intended to be sent to the Singleton Heritage Advisory Council (SHAC) to review prior to the SHAC recommending for approval or rejection to Council. MTW will continue to consult with Council during 2021 on the HHCF processes to ensure the positive outcomes that the funding is intended to achieve can be realised in the Singleton area.

There were no incidents or any unauthorised disturbance caused to historic heritage sites at MTW during 2020.

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 2020 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; and

- A review of fixed tower lighting at the Warkworth West Pit Park Up location, north or the Putty Road.

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.

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.

The Putty Road visual bund, extended to the west to the junction of the Sealed Geo Road (former Wallaby Scrub Road) during 2019, was seeded in 2020. A section of deceased trees along the South Pit of Warkworth adjacent to the Putty Road were removed in 2019 to improve visual amenity, with infill planting which was intended to occur in 2020, to occur in 2021 in this area.
A boundary fence audit was undertaken across MTW in May 2020 to identify fences that required repairs, maintenance or replacement. Maintenance of fence lines along Putty Road was undertaken in June.

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 all water management structures and key pipelines are shown in **Figure 22**. The MTW Water Management Plan contains further detail on management practices and is available on the webpage https://insite.yancoal.com.au.

Improvements to water management in 2020 included mitigating the risk of unauthorised water releases from site with concept design and geotechnical assessments undertaken to improve water management of Warkworth's North Pit North area, and design and construction of sediment control water management infrastructure for the advancing pre-strip.

In accordance with the WMP, the new sediment control water management infrastructure has been sized using design methods of the "Blue Book": Managing Urban Stormwater; soils and construction (Volume 2E Mines and Quarries, NSW Dept of Environment and Climate Change, 2008). Design rainfall is the 85th percentile five-day rainfall depth of 31mm. Works commenced in November 2020 and were nearing completion at the end of the reporting period.

The remote boundary dam monitoring system installed during 2019 has been considered a success, and additional boundary dam monitoring systems were installed during 2020. Dams 1S, 2S and 10S had the units installed in December 2020, with the plan to be fully commissioned in the next reporting period. An additional two units were also purchased for installation at two new sediment dams constructed as part of the Warkworth pre-strip water management.

There were no new water storage facilities constructed during the reporting period. Capping of the sites Tailings Dam 2 (Dam 33N) continued during the reporting period.

There were two reportable water related incidents during the reporting period which occurred on 9 February 2020 and 14 May 2020. The incident on 9 February 2020 involved the overtopping of two boundary dams at Warkworth (Dam 50N and Dam 53N) as a result of a greater than design rainfall event (91.4 mm). WML received notification on 19 February 2020 from DPIE that they would not be taking action at this time and on 2 March 2020 from the EPA stating they would not be taking any regulatory action. The incident on the 14 May 2020 involved the overtopping of a Mount Thorley surface water dam (Dam 9S) as a result of the automatic valve between Dam 6S and Dam 9S remaining open, permitting Dam 9S to fill and overtop. An official caution was received from the EPA in October 2020. Further details on this incident and the actions taken by MTW are provided in **Section 10**.

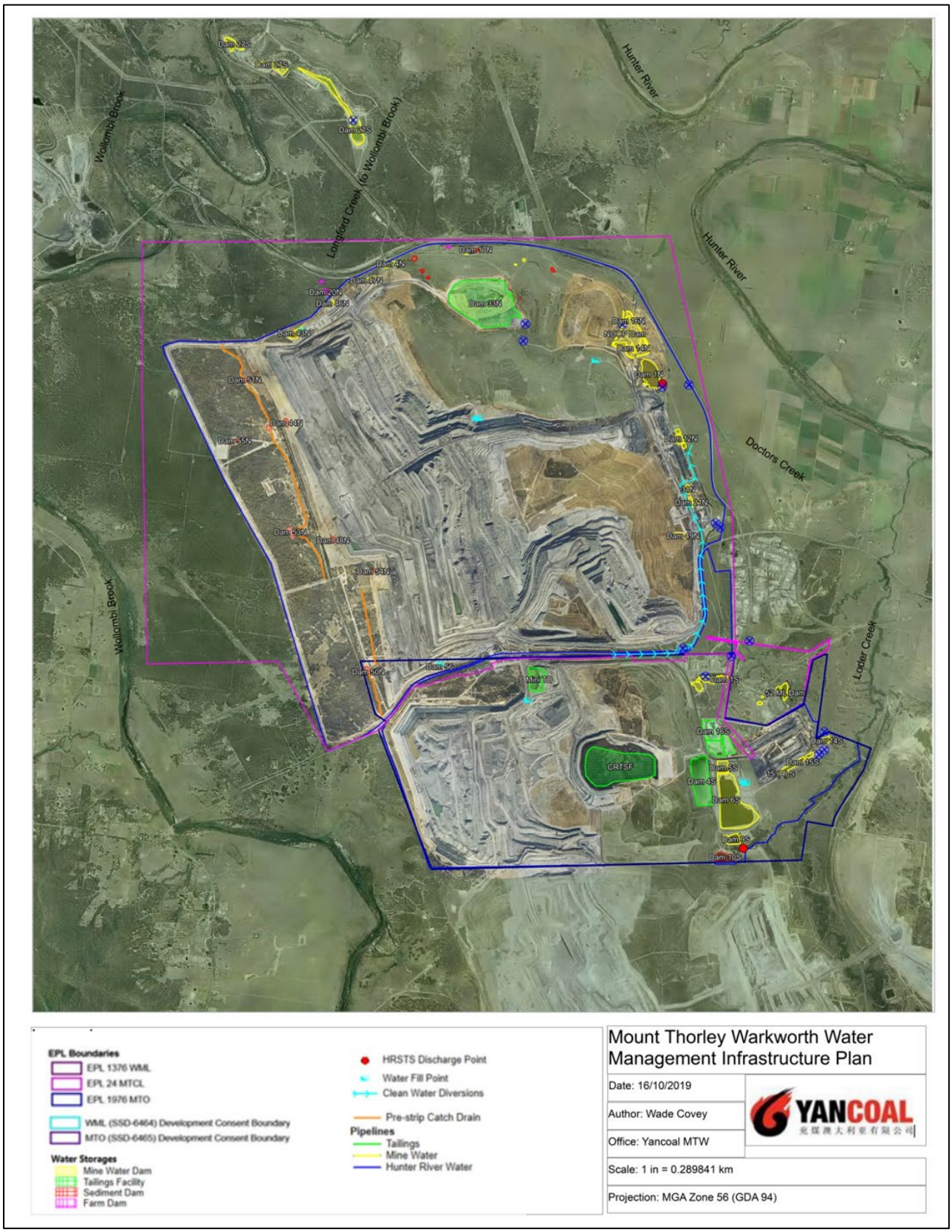


FIGURE 22: WATER MANAGEMENT INFRASTRUCTURE PLAN

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 2020 static water balance for MTW is presented in **Table 6.14** and a simplified schematic of this balance is included in **Figure 23**. A salt flux schematic is shown **in Figure 24**.

TABLE 6.12 STATIC MODEL RESULTS, ANNUAL WATER BALANCE

Water Stream	Volume (ML) (% Total)
Inputs	
Rainfall Runoff	7,657 (68%)
Hunter River (MTJV supply scheme)	1,455 (13%)
Potable (Singleton Shire Council / trucked)	20 (<1%)
Groundwater	428 (4%)
Recycled to CHPP from tailings (not included in total)	5,529
Imported (LUG bore)	565 (5%)
Imported (Hunter Valley Operations)	0 (0%)
Water from ROM Coal	1075 (10%)
Total Inputs	**11,199**
Outputs	
Dust Suppression	3,030 (35%)
Evaporation – mine water dams	1,402 (16%)
Entrained in process waste	2,265 (26%)
Sharing with other mines	0 (0%)
Discharged (HRSTS)	0 (0%)
Water in coarse reject	580 78%)
Water in product coal	1,213 (14%)
Miscellaneous use (wash-down etc.)	110 (1%)
Total Outputs	**8,600**
Change in storage	**2,599**

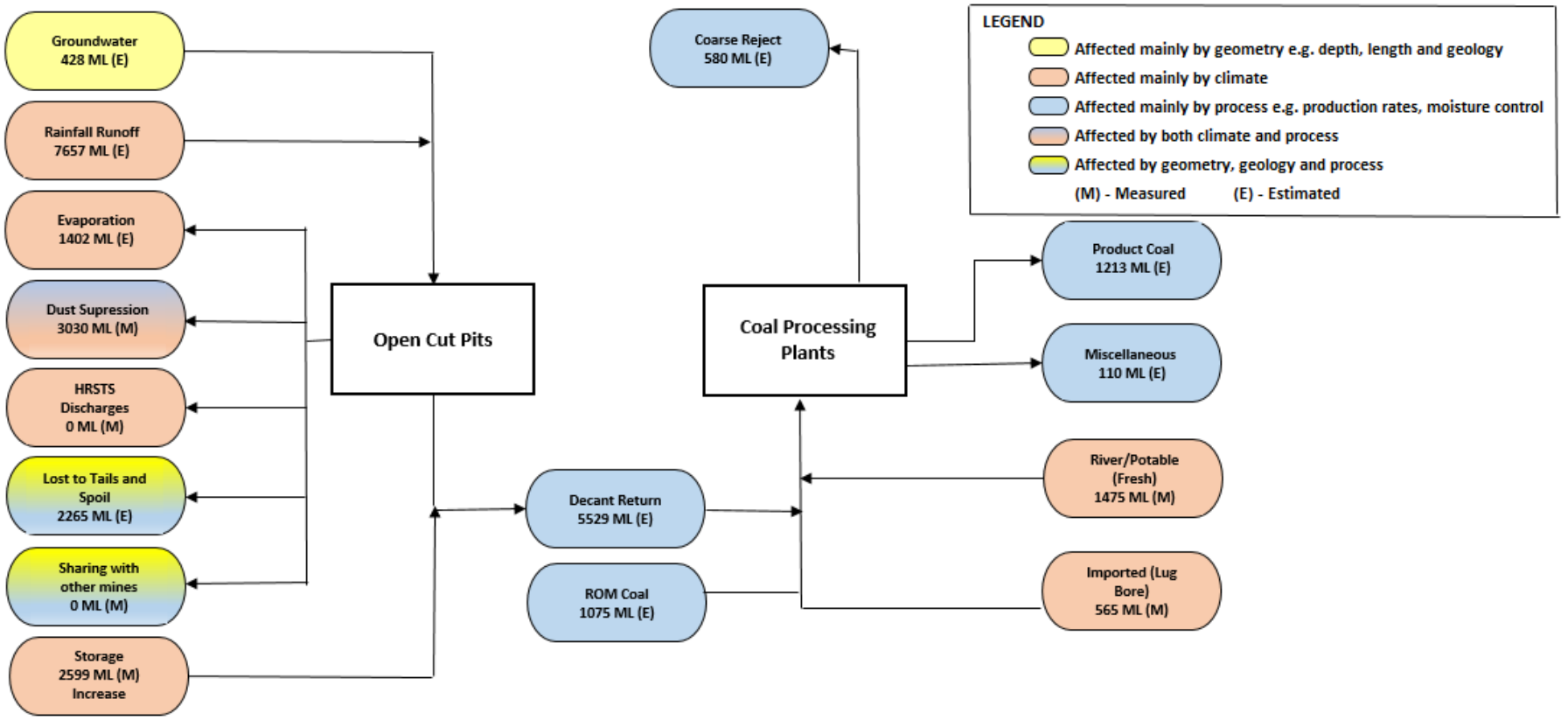


FIGURE 23: SCHEMATIC DIAGRAM MTW WATER FLUX

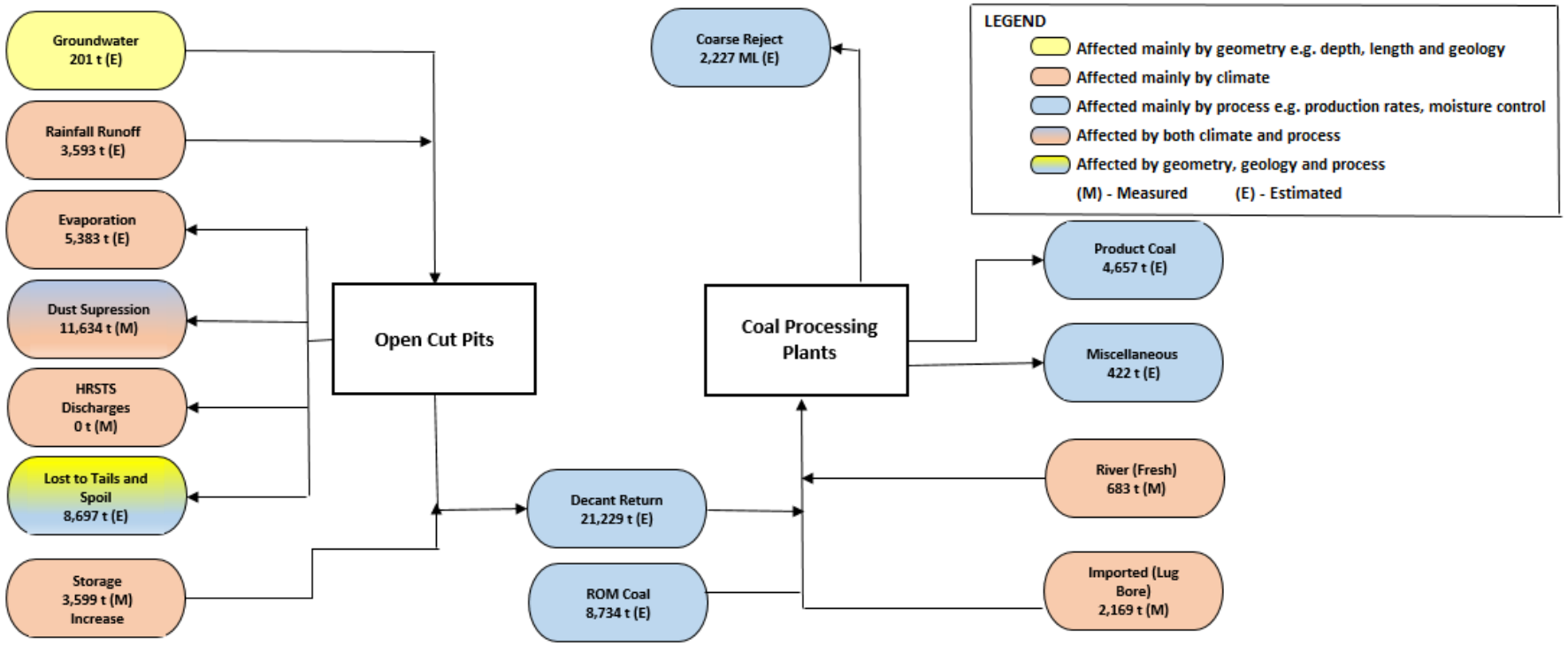


FIGURE 24: SCHEMATIC DIAGRAM MTW SALT FLUX

6.7.2.1 Water Inputs

A total of 828.5mm of rainfall was recorded at MTW in 2020 producing a calculated 7,657 ML 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 2020.

As the site water inventory is drawn down, water is imported to meet site demand. During the reporting period 565 ML was imported from the LUG bore by MTW. This volume was a significant decrease on the previous reporting period (1,731ML extracted), due to on site water availability.

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.

During the reporting period an additional 2,000 ML of high security water licenses were secured by MTW and a portion of this licence was transferred to the MTJV license to further supplement the operations water supply. It should be noted that due to the nature of the Water NSW reporting period, some temporary allocation assignments were executed in the 2020 AER reporting period, however, water was abstracted in the 2019 reporting period. A total of 1,455 ML of water was abstracted from the Hunter River during the reporting period for MTW operations which was comparable to the volume of water extracted in the previous reporting period. (1,594 ML extracted in 2019).

Groundwater Licences under Part 5 of the Water Act 1912 are held for each mining excavation area, to account for passive take via seepage inflows. Water Licences held by MTW are detailed in **Table 3.5.**

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.

6.7.2.2 Water Outputs

Significant water uses at MTW in 2020 were for dust suppression on haul roads, mining areas and coal stockpiles (3,030ML), evaporation from Dams (1,402ML) and water entrained in process waste (2,265ML). Water usage for dust suppression on haul roads slightly decreased compared to the 2019 reporting period which may be attributed to wetter climatic conditions during the reporting period.
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. HRSTS discharges are undertaken in accordance with HRSTS regulations, 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, MTW did not discharge under the HRSTS.

6.7.3 Surface Water Management

Surface water monitoring activities continued in 2020 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 25**. 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, EC and 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.

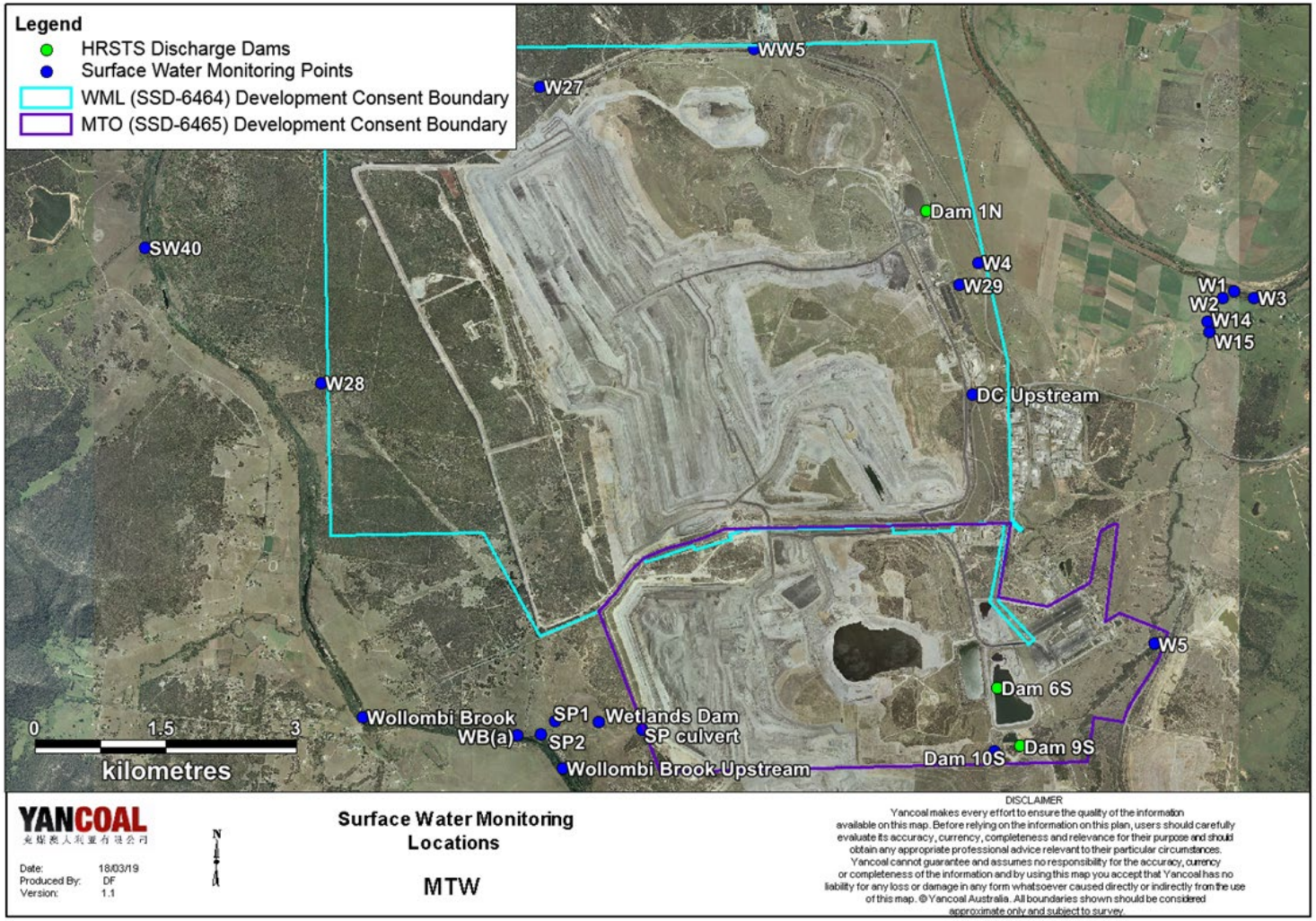


FIGURE 25: SURFACE WATER MONITORING POINTS

6.7.4 Surface Water Performance

Routine surface water monitoring was undertaken from twelve (12) sites and rain event sampling was undertaken from thirteen (13) sites (see **Table 6.15** below). 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, Electrical Conductivity (EC) and Total Suspended Solids (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). Due to above average rainfall during the reporting period, five rain event sampling runs were completed in 2020. All required sampling and analysis was undertaken, except as detailed in **Table 6.15**. Trigger tracking results are described in **Table 6.16**.

TABLE 6.13 MTW WATER MONITORING DATA RECOVERY FOR 2020 (BY EXCEPTION)

Location	Data Recovery (%)	Comment
SP1	60%	Site recorded as dry in October and November
SP2	60%	Site recorded as dry in February and no access in July
W28	60%	No safe access to site in February and March
Wetlands Dam	80%	Site recorded as dry in March
W5	85%	Site recorded as dry in January and February
WW5	25%	Site recorded as dry in June and insufficient water for sampling for September and December
W2	75%	Insufficient water for sampling in December
Wollombi Brook	50%	No safe access to site in June and September

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://insite.yancoal.com.au/).

Figure 26 to **Figure 31** 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. Single elevated EC levels were recorded at the Wollombi Brook Downstream (W28) and Loders Creek Downstream monitoring sites during the reporting period. It is expected that the readings were a result of the prolonged dry climatic conditions (drought) experienced during the previous reporting periods followed by rain events during the reporting period and not related to mining impacts.

Measurements of pH were generally stable during the reporting period across the majority of sites and consistent with historical seasonal trends. A few sites triggered 5th percentile/lowers limits during the reporting period, refer to **Table 6.16**. pH results recorded were neutral water quality or within 1 pH point of neutral. It is expected that the readings were a result of fresh surface water flows following rain events and not related to mining impacts.

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 6.16**. MTW undertook investigations into the elevated TSS readings at W2 (Loders Creek), W3 (Hunter River), W4 (Doctors Creek), W5 (Loders Creek), W14 (Loders Creek), W27 (Longford Creek) and W29 (Doctors Creek) during the reporting period. The investigations concluded that the elevated results were most likely attributed to the rainfall event received prior to sampling. Monitoring results will continue to be watched. These results are also provided in the Monthly reports provided on the MTW Insite website (https://insite.yancoal.com.au/).

TABLE 6.14 SURFACE WATER MONITORING - TRIGGER TRACKING RESULTS

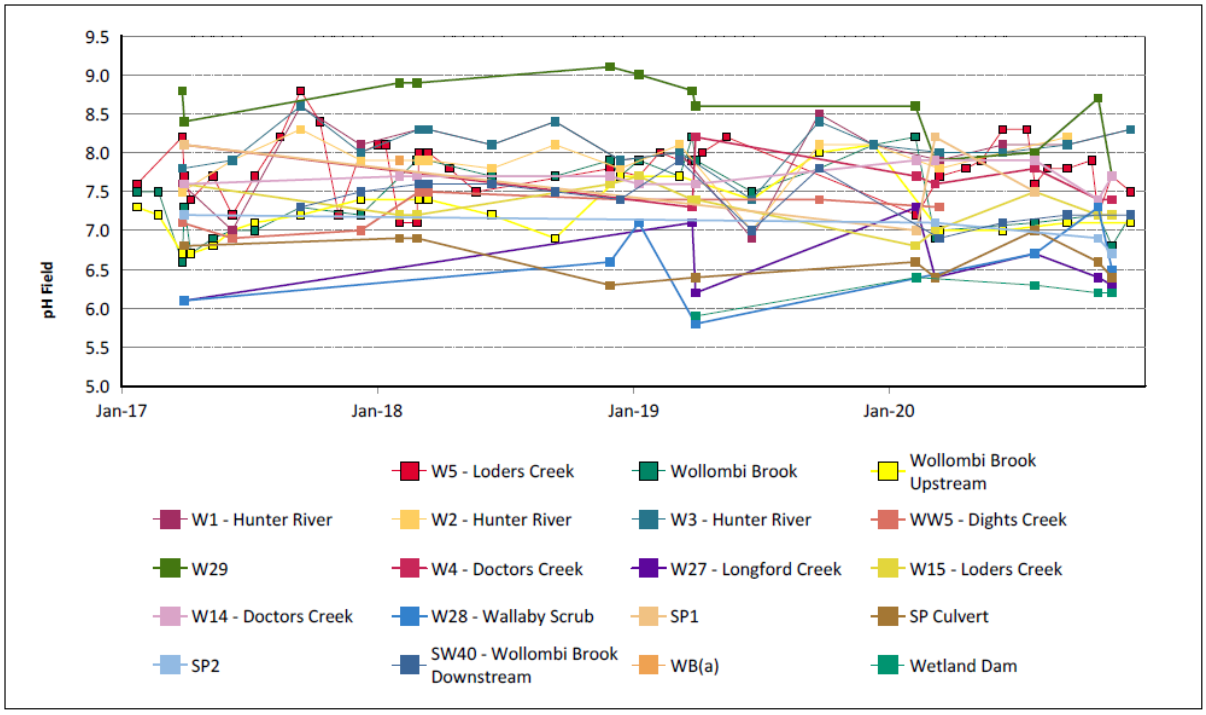
Site	Date	Trigger Limit Breached	Action Taken in Response
W14	16/10/2020	EC -95th Percentile	Watching Brief*
W28	14/11/2020	EC -95th Percentile	Watching Brief*
W5	09/02/2020	pH –5th Percentile	Watching Brief*
W15	07/02/2020	pH –5th Percentile	Watching Brief*
W15	07/03/2020	pH –5th Percentile	Watching Brief*
W15	25/10/2020	pH –5th Percentile	Watching Brief*
W15	14/11/2020	pH –5th Percentile	Watching Brief*
W27	07/03/2020	pH –5th Percentile	Watching Brief*
W29	27/07/2020	pH –5th Percentile	Watching Brief*
W29	14/11/2020	pH –5th Percentile	Watching Brief*
SW40	13/03/2020	pH –5th Percentile	Watching Brief*
SP1	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Elevated TSS results most likely attributable to rainfall event (91.4mm from 6 February to and including 9 February).
SP1	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July).
W1	13/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Note: Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to regional rainfall.
W1	11/06/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Note: Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to regional rainfall.
W2	13/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*.

Site	Date	Trigger Limit Breached	Action Taken in Response
			Note: Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to regional rainfall.
W2	11/06/2020	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS considered associated with recent rainfall and increased flow rates in the river at the time. Consistent with nearby W1 and W3 measurements. No signs of mining related impact.
W3	13/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Note: Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to regional rainfall.
W3	11/06/2020	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS considered associated with recent rainfall and increased flow rates in the river at the time. Consistent with nearby W1 and W3 measurements. No signs of mining related impact.
W4	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W4	07/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (56mm from 3 March to and including 7 March).
W4	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July).
W4	14/11/2020	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Elevated TSS most likely attributable to rainfall event (32.2mm on 14 November).
W5	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W5	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July).

Site	Date	Trigger Limit Breached	Action Taken in Response
W5	14/11/2020	TSS – 50mg/L (ANZECC criteria)	Elevated TSS most likely attributable to rainfall event (32.2mm on 14 November).
W14	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W14	07/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (56mm from 3 March to and including 7 March).
W14	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July).
W14	14/11/2020	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Elevated TSS most likely attributable to rainfall event (34.0mm on 14 November).
W15	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July).
W27	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W27	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July).
W27	25/10/2020	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Elevated TSS most likely attributable to rainfall event (34.0mm on the 24 October).
W27	14/11/2020	TSS – 50mg/L (ANZECC criteria)	Elevated TSS most likely attributable to rainfall event (34.0mm on 14 November).
W29	07/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W29	07/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (56mm

Site	Date	Trigger Limit Breached	Action Taken in Response
			from 3 March to and including 7 March).
W29	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July).
W29	25/10/2020	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Elevated TSS most likely attributable to rainfall event (34.0mm on the 24 October).
W29	14/11/2020	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Elevated TSS most likely attributable to rainfall event (34.0mm on 14 November).

* = 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 26: WATERCOURSE PH TRENDS 2017 TO 2020

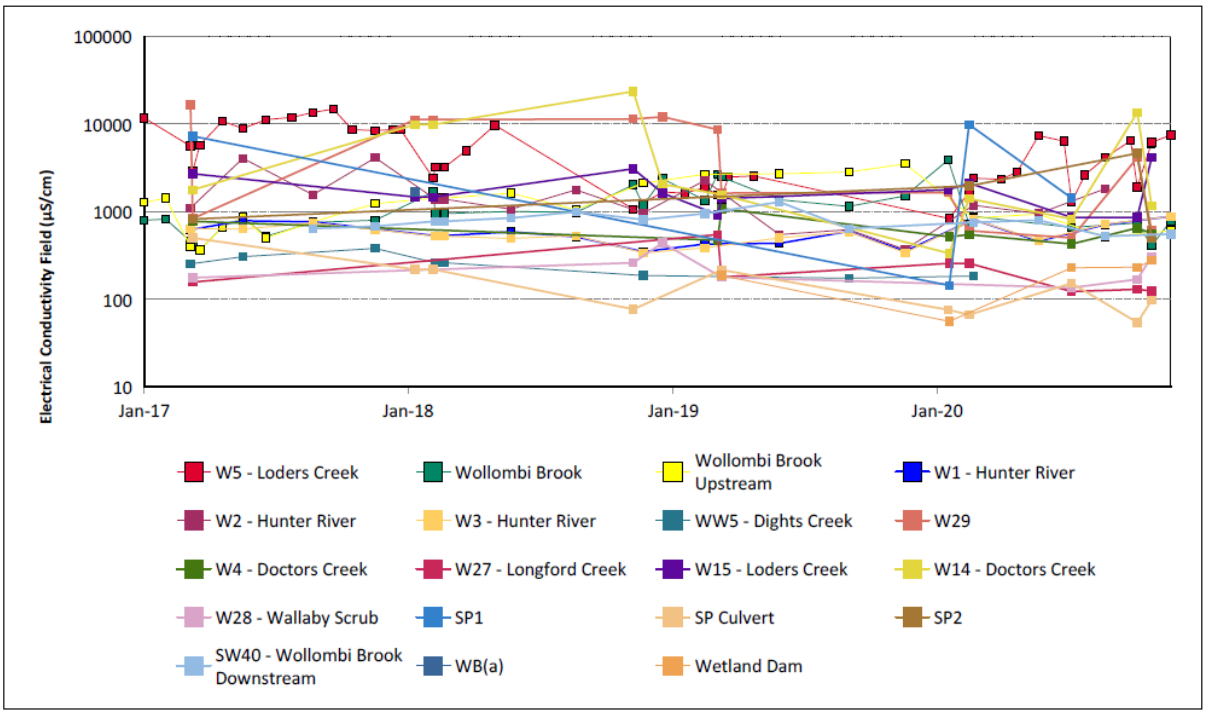


FIGURE 27: WATERCOURSE EC TRENDS 2017 TO 2020

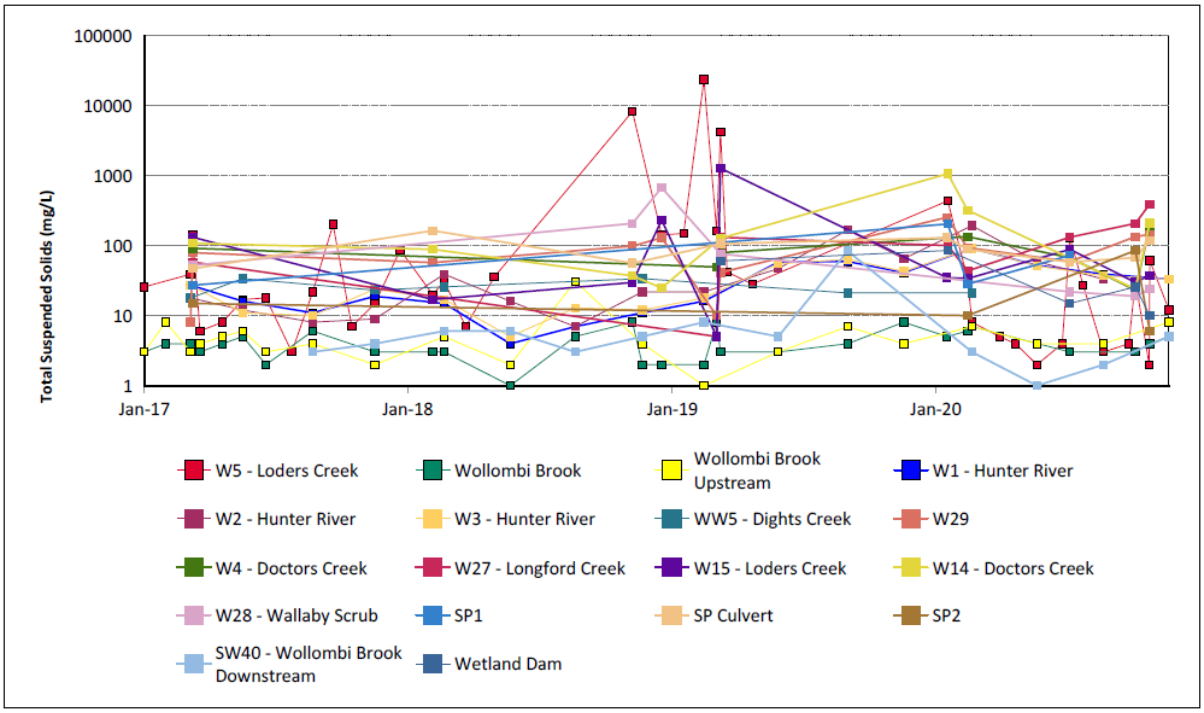


FIGURE 28: WATERCOURSE TSS TRENDS 2017 TO 2020

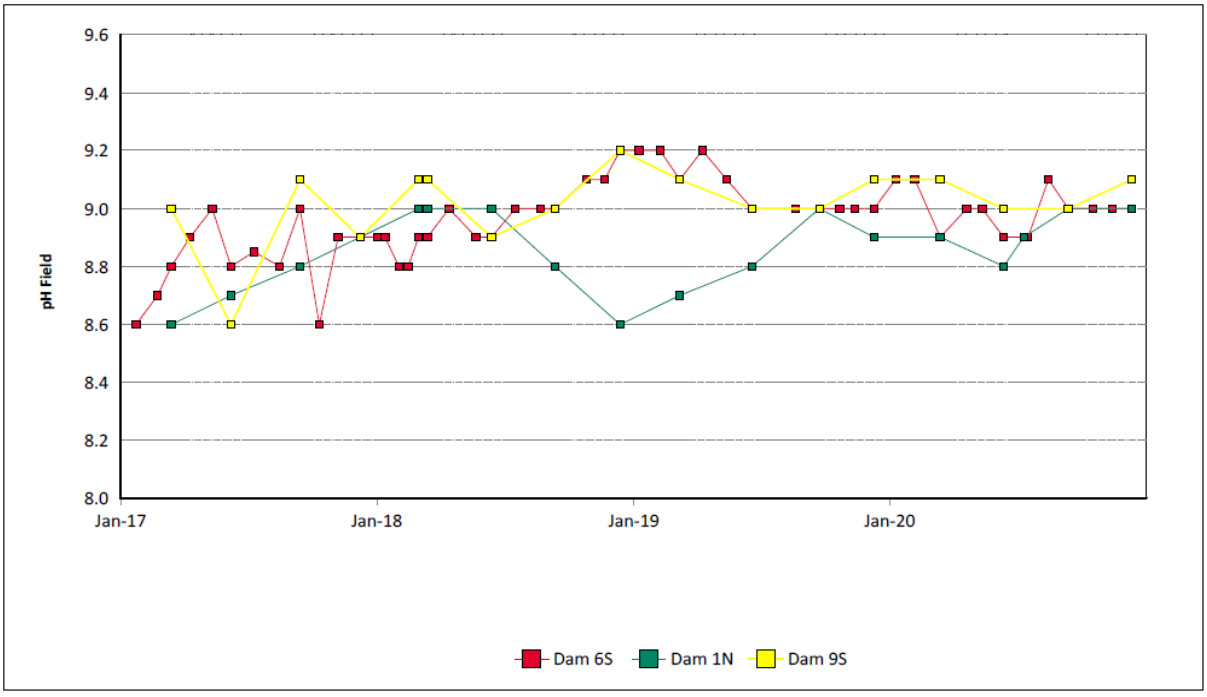


FIGURE 29: SITE DAMS PH TRENDS 2017 TO 2020

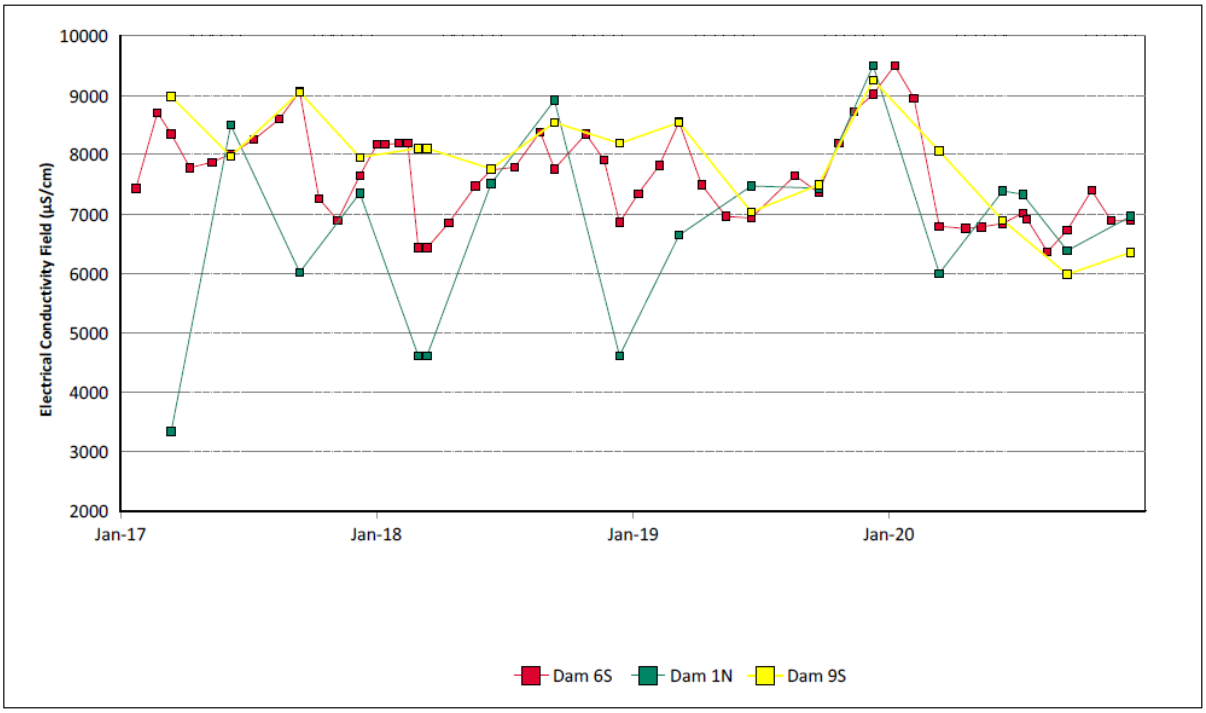


FIGURE 30: SITE DAMS EC TRENDS 2017 TO 2020

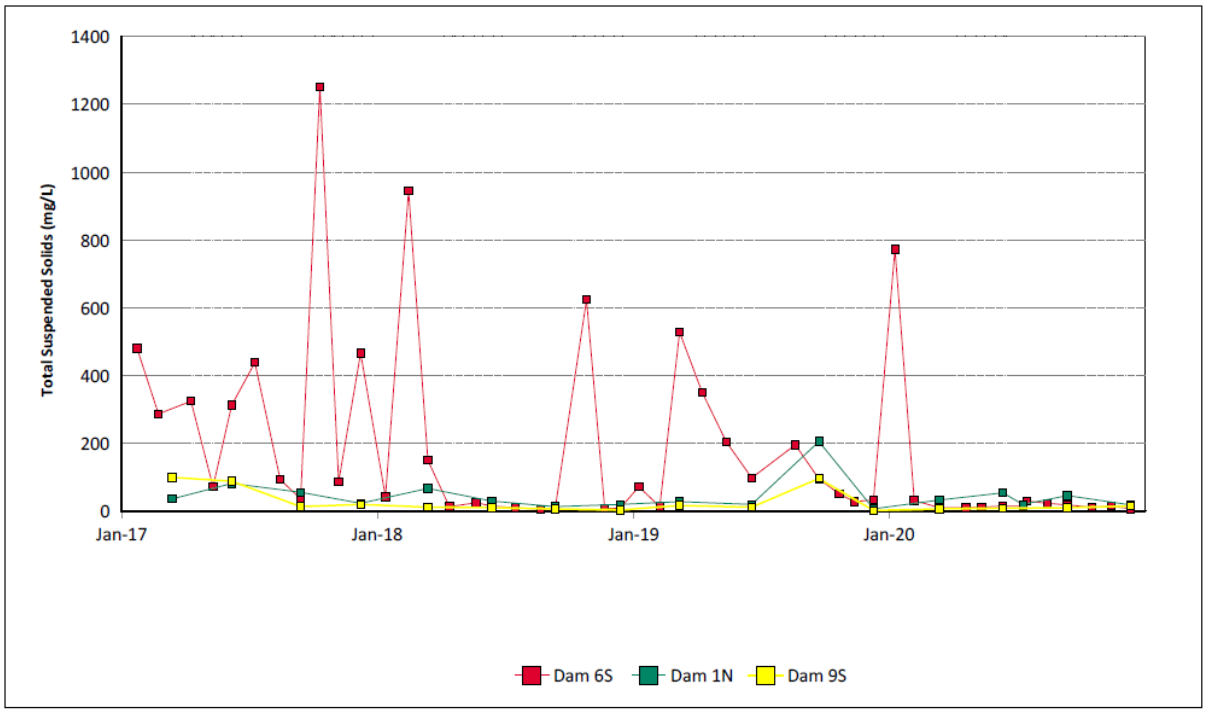


FIGURE 31: SITE DAMS TSS TRENDS 2017 TO 2020

6.7.4.1 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 has previously 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 stability monitoring report is provided as **Appendix 3**. This year of monitoring was subjected to a significantly wetter year than the previous rounds of monitoring and that was reflected by an increase in vegetation growth. As outlined in the report, stream health and channel stability monitoring results in 2020 indicated that channel stability in Wollombi Brook had remained generally the same as the previous year's monitoring cycle conditions.

The results of this monitoring survey indicate that both stream health and channel stability fluctuate over different sections of Loders Creek. The survey identified that some sections of Loders Creek are currently eroding and are vulnerable to further erosion with areas of significant erosion observed. These areas are generally associated with exposed dispersive sub-soils, which hamper vegetation establishment by the development of a hard surface crust when the soil is dry, and the 'melting' nature of the soil when wet.

The survey identified that the majority of Loders Creek displayed stable environments. Sections of the creek experience active erosion as a result of natural influences. Improvements were also identified during the 2020 survey, resulting from both natural occurrences as well as man-made upgrade works undertaken in 2018 at MTW Discharge Point.

As outlined in the report, stream health and channel stability monitoring results in 2020 indicated that channel stability in Wollombi Brook had remained generally the same as the previous year's monitoring cycle conditions and that the majority of Loders Creek displayed stable environments. Generally, the monitoring identified that both creeks have not significantly changed from what was observed during the previous survey.

6.7.5 Groundwater Management

Groundwater monitoring activities were undertaken in 2020 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.

The groundwater monitoring programme at MTW measures the quality of groundwater against background data, EIS predictions and historical trends. Ground water 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. MTW modified its groundwater sampling methodology during the reporting period following a recommendation in the 2018 annual groundwater review undertaken by an independent groundwater consultant. Accordingly bore purging is undertaken across the monitoring network for routine samples (where infrastructure allows) to ensure a representative sample is collected in accordance with industry standards.

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 32** and the annual Ground Water Review report can be found in **Appendix 4.**

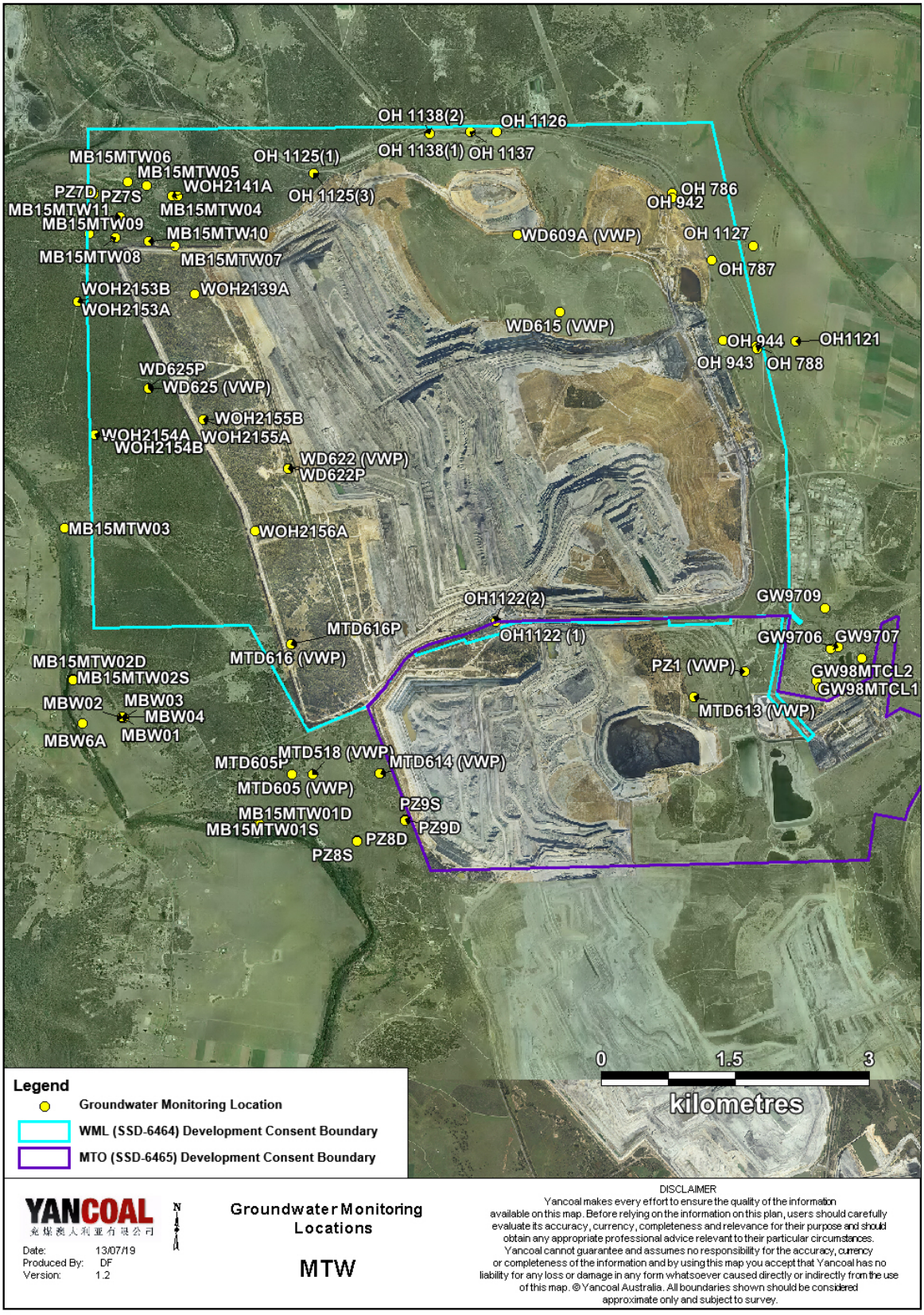


FIGURE 32: GROUNDWATER MONITORING NETWORK AT MTW IN 2020

6.7.6 Groundwater Performance

Sampling of ground waters was carried out on 275 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 6.17**.

TABLE 6.15 MTW WATER MONITORING DATA RECOVERY FOR 2020 (BY EXCEPTION)

Location	Data Recovery (%)	Comment
MB15MTW04	0%	Insufficient water for sampling in 2020
MB15MTW05	0%	Insufficient water for sampling in 2020
MB15MTW06	0%	Insufficient water for sampling in 2020
MB15MTW07	0%	No safe access in February. Insufficient water for sampling in May, August and November.
MB15MTW08	0%	No safe access in February. Insufficient water for sampling in May, August and November.
MB15MTW09	0%	No safe access in February. Insufficient water for sampling in May, August and November.
MB15MTW10	0%	No safe access in February. Insufficient water for sampling in May, August and November.
MB15MTW11	0%	No safe access in February. Insufficient water for sampling in May, August and November.
OH943	0%	Insufficient water for sampling in March, June, September and December
OH944	0%	Insufficient water for sampling in March, June, September and December
OH1137	0%	Insufficient water for sampling in March, June, September and December
PZ9S	0%	Insufficient water for sampling in March, June, September and December
WOH2156B	25%	Insufficient water for sampling in February, May and November

A summary of the monitoring results for MTW Groundwater Sites is provided in the Monthly Environmental Monitoring Reports, available via MTW's website (https://insite.yancoal.com.au/document-library/monthly-reporting-mtw).

The following sections present groundwater monitoring data in relation to the geographic locations and target stratigraphy for groundwater monitoring bores. Each location is discussed below, and a summary of monitoring data presented. Where monitoring results were recorded outside the internal trigger limit, these results are summarised in tables for each location.

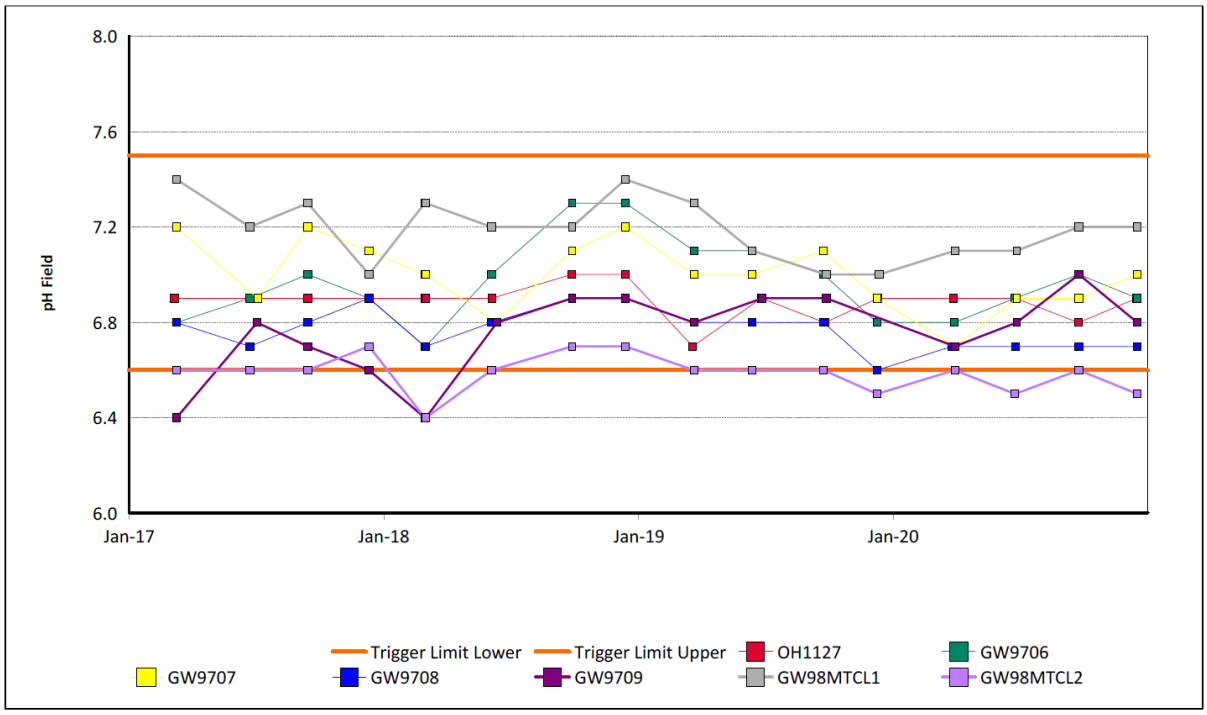
6.7.6.1 Bayswater Seam Bores

Groundwater monitoring in the Bayswater seam was undertaken from seven sites during 2020. A total of 28 samples were collected during the reporting period. The pH, EC and SWL trends for 2017 to 2020 for Bayswater groundwater bores are shown in **Figure 33** to **Figure 35** respectively. Trigger tracking results are shown in **Table 6.18**. Results were generally stable or have increased (SWL) during 2020. Further detailed overview of monitoring results from these bores is provided in **Appendix 4**.

TABLE 6.16 BAYSWATER SEAM GROUNDWATER 2020 INTERNAL TRIGGER TRACKING

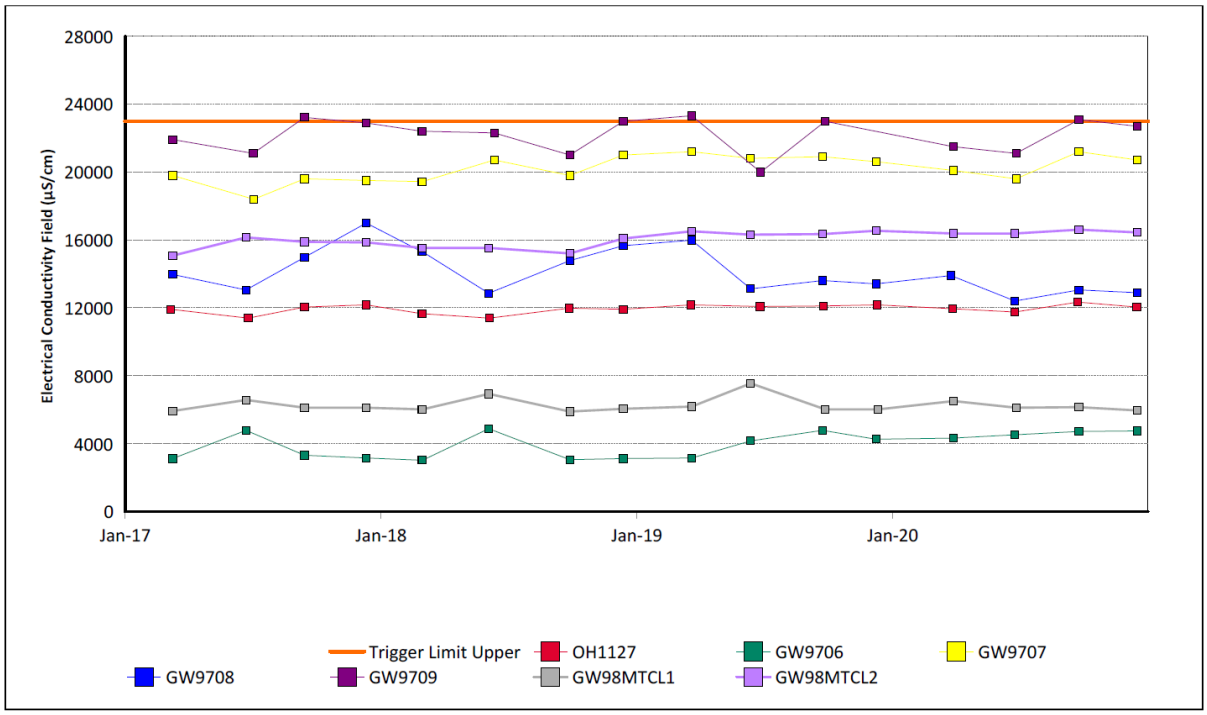
Location	Date	Trigger limit	Action taken in response
GW9709	23/09/2020	**EC – 95th percentile**	Watching Brief* Monitoring results back within trigger limits for December 2020 sample round.
GW98MTCL2	23/06/2020	**pH – 5th percentile**	Watching Brief* Monitoring results back within trigger limits for September 2020 sample round.
GW98MTCL2	16/12/2020	**pH – 5th percentile**	Watching Brief*

** = 1st/2nd trigger. Watching Brief established pending outcomes of subsequent monitoring events. No specific actions required*



Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 33: BAYSWATER SEAM PH TRENDS 2017 TO 2020



Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 34: BAYSWATER SEAM EC TRENDS 2017 TO 2020

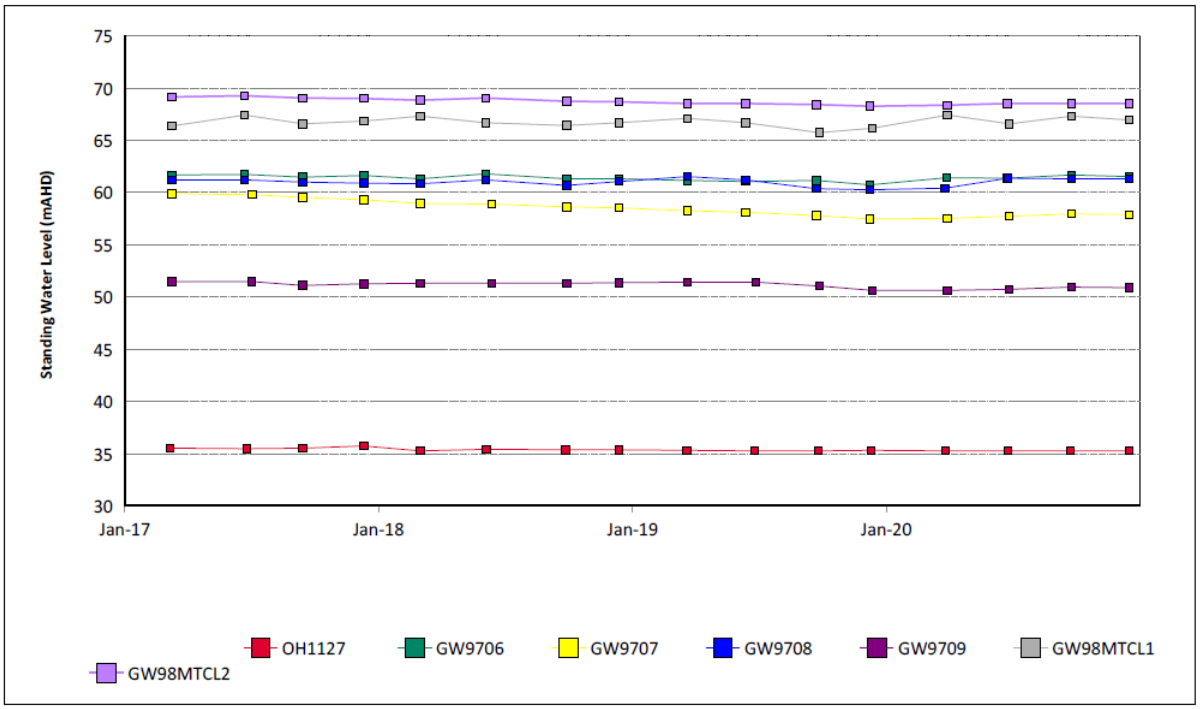


FIGURE 35: BAYSWATER SWL TRENDS 2017 TO 2020

6.7.6.2 Bowfield Seam Bores

Groundwater monitoring in the Bowfield seam was undertaken at one site during 2020. A total of four samples were collected during the reporting period. The pH, EC and SWL trends for 2017 to 2020 are shown in **Figure 36, Figure 37, Figure 38** respectively. Water quality results were similar to historical data throughout the reporting period. The SWL in Bore OH1125 decreased during the reporting period. Bore OH1125(3) is located directly to the north of North Pit and the decline may relate to drawdown towards active mining within the pit to the south. As mentioned in the previous annual review, the trend may also be influenced by cumulative sources with the abstraction from LUG Bore contributing to the decline.

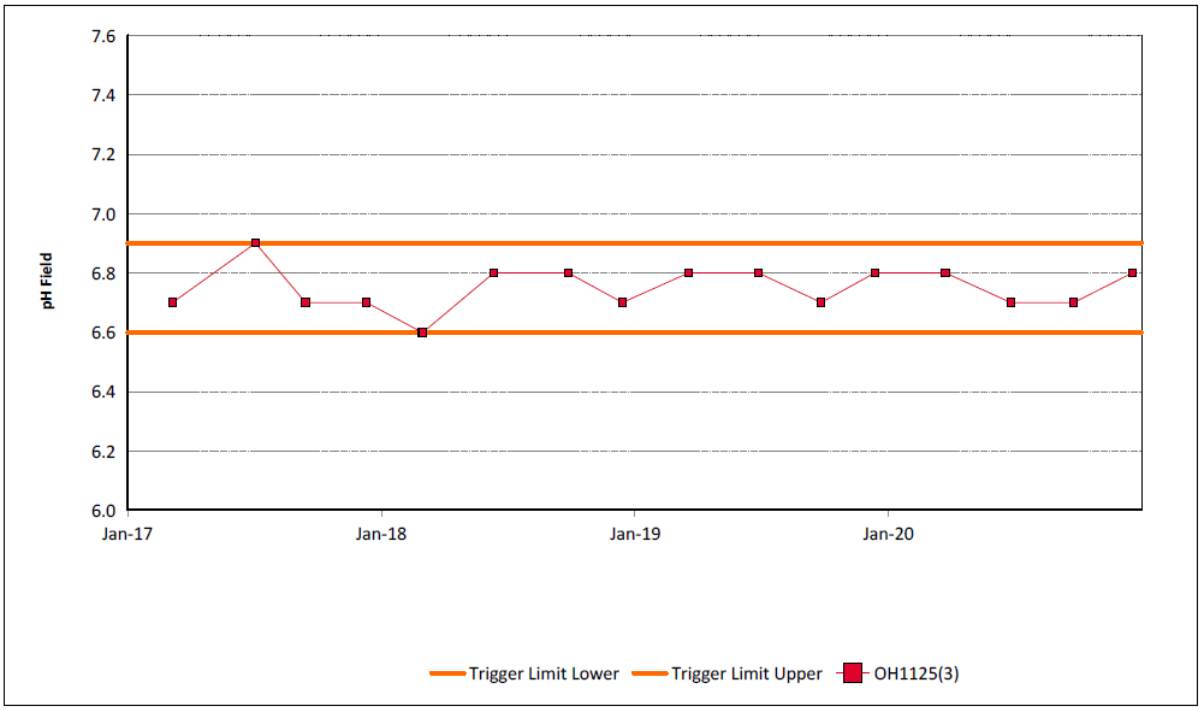


FIGURE 36: BOWFIELD SEAM PH TREND 2017 TO 2020

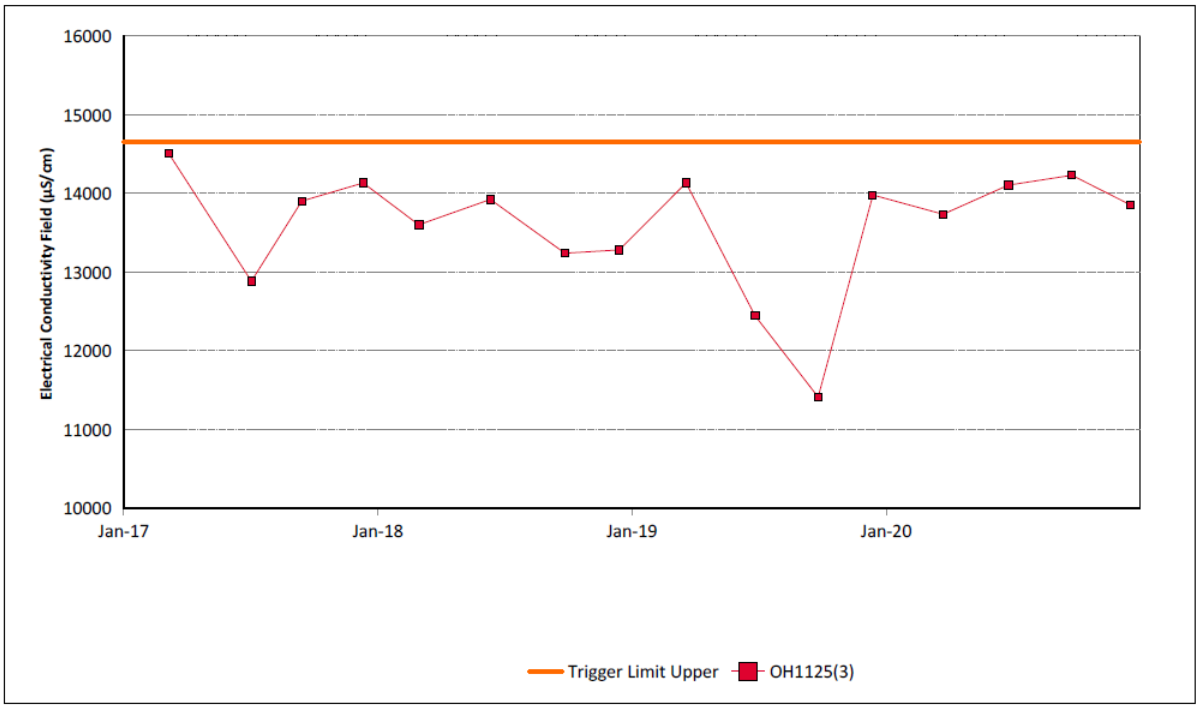


FIGURE 37: BOWFIELD SEAM EC TRENDS 2017 TO 2020

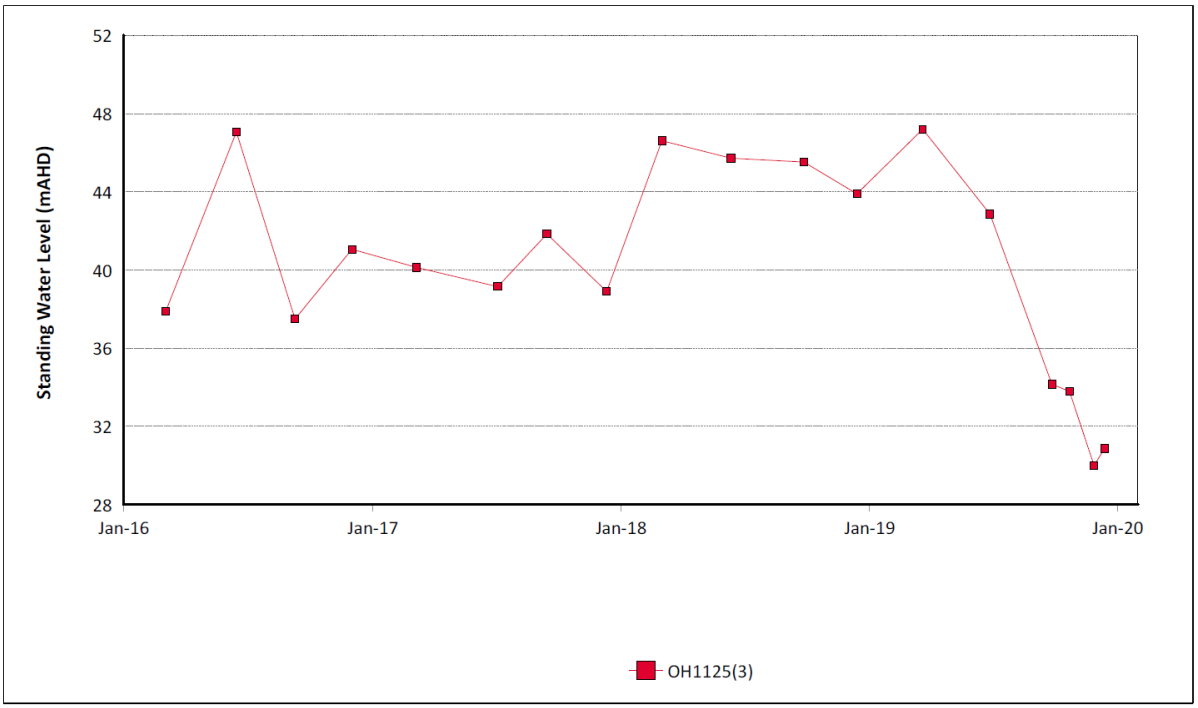


FIGURE 38: BOWFIELD SWL TRENDS 2017 TO 2020

6.7.6.3 Blakefield Seam Bores

Groundwater monitoring in the Blakefield seam was undertaken from three sites during 2020. A total of 12 samples were collected during the reporting period. The pH, EC and SWL trends for 2017 to 2020 are shown in **Figure 39, Figure 40** and **Figure 41** respectively. Trigger tracking results are shown in **Table 6.19**. Water quality trends were generally steady with an increasing pH trend observed in WOH2139A. The elevated pH is likely a result of the declining water levels due to depressurisation from the open cut operations. Groundwater levels generally declined within the Blakefield Seam over the 2020 reporting period. The SWL results are described further in the Annual Groundwater Review (**Appendix 4**).

TABLE 6.17 BLAKEFIELD SEAM GROUNDWATER 2020 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
WOH2139A	25/02/2020	**pH – 95th percentile**	Investigation Completed* As outlined in the 2019 Annual Groundwater Review pH values associated with bore WOH2139A are most likely attributable to the decreasing standing water level as a result of depressurisation from active mining in North Pit. Monitoring to continue to be undertaken quarterly.
WOH2139A	25/08/2020	**pH – 95th percentile**	Watching Brief* Monitoring results back within trigger limits for November 2020 sample round.

** = 1st/2nd trigger. Watching Brief established pending outcomes of subsequent monitoring events. No specific actions required*

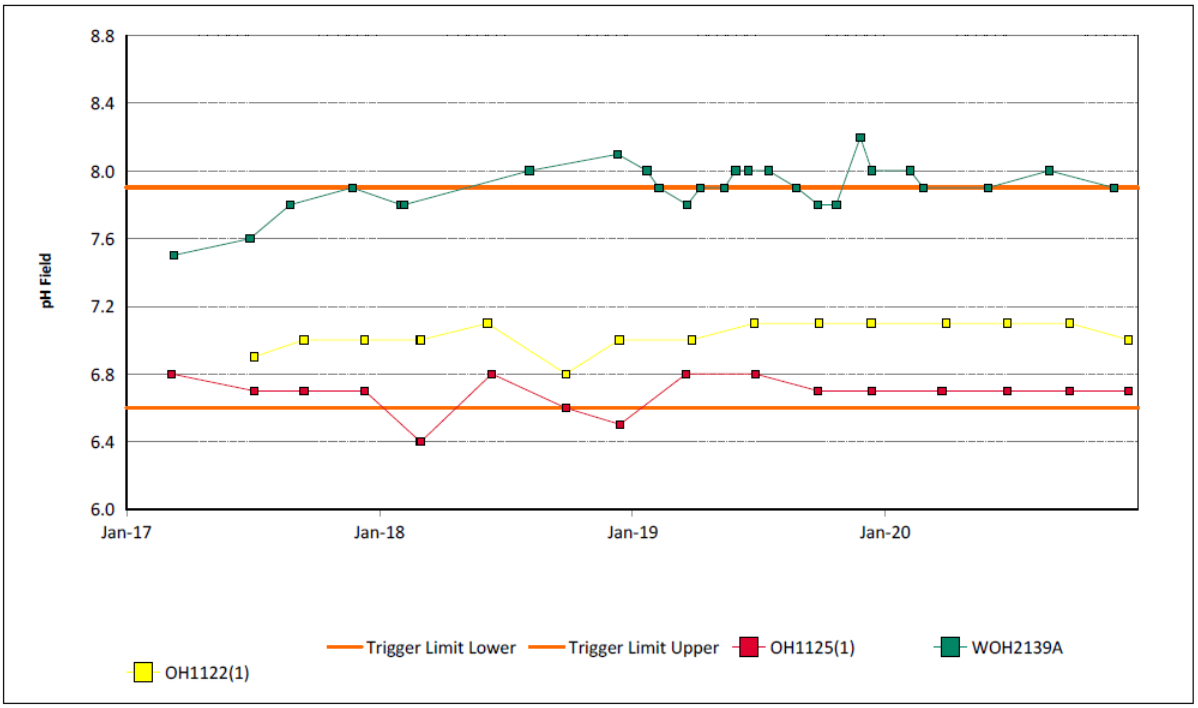


FIGURE 39: BLAKEFIELD SEAM GROUNDWATER PH TRENDS 2017 TO 2020

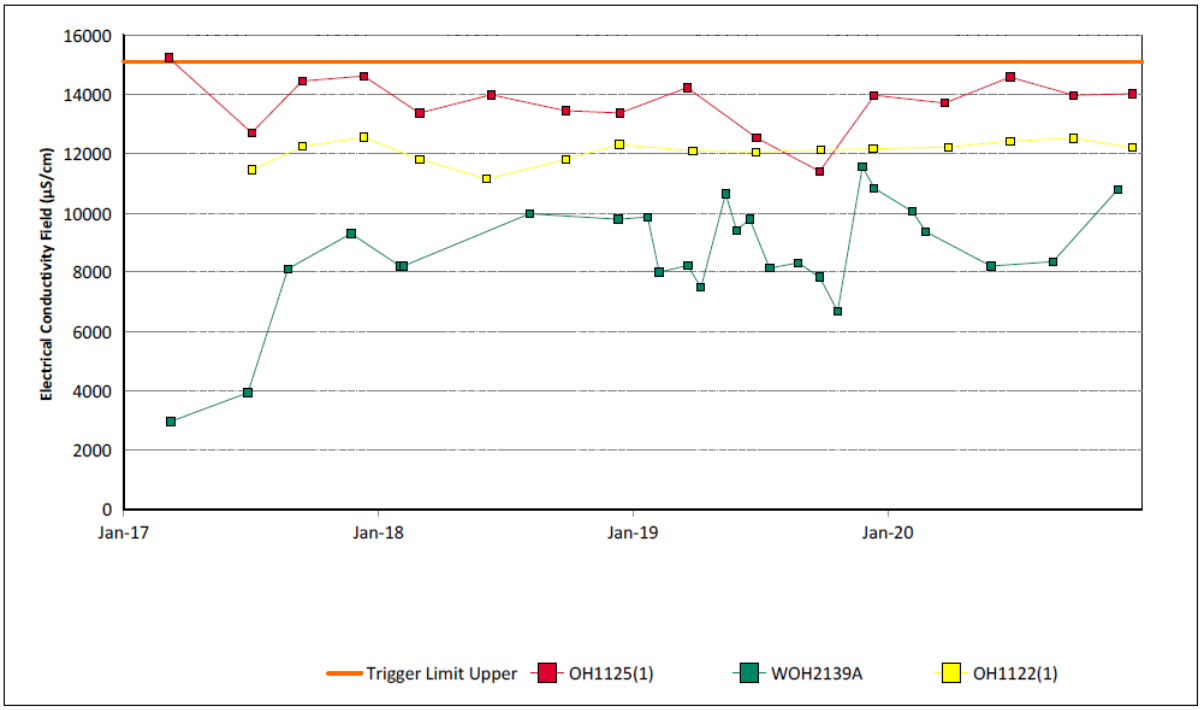


FIGURE 40: BLAKEFIELD SEAM GROUNDWATER EC TRENDS 2017 TO 2020

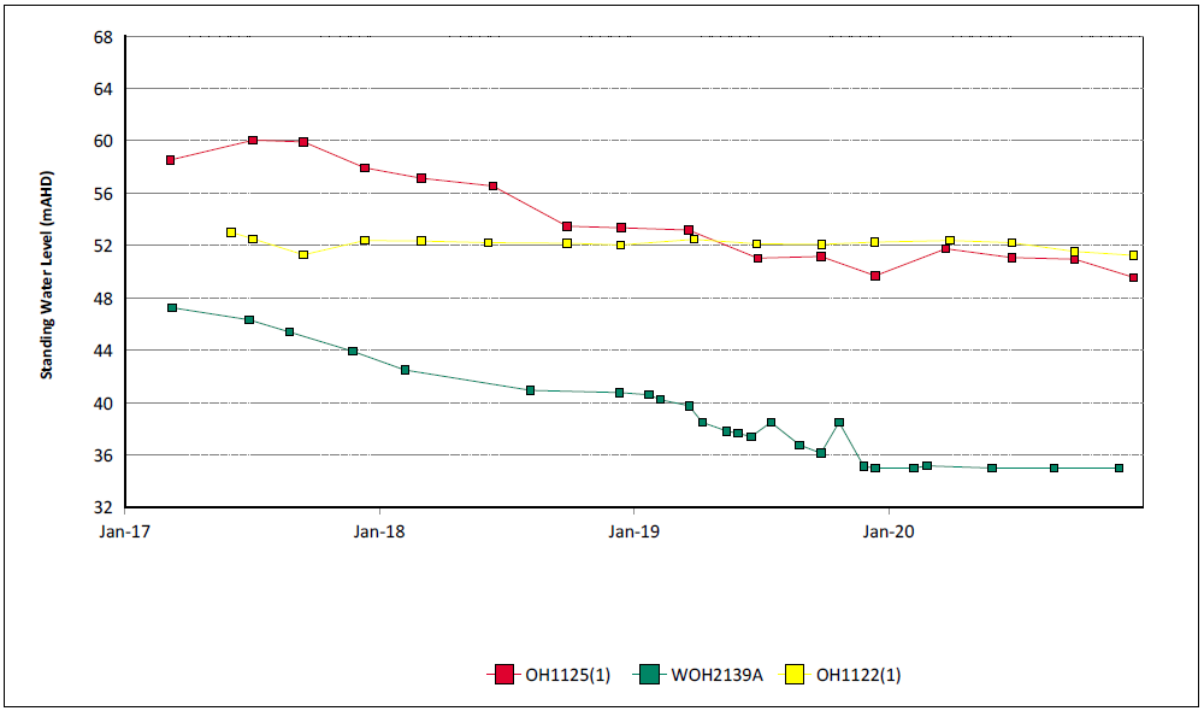


FIGURE 41: BLAKEFIELD SEAM GROUNDWATER SWL TRENDS 2017 TO 2020

6.7.6.4 Hunter River Alluvium Bores

Groundwater monitoring in the Hunter River Alluvium was undertaken from five sites during 2020. A total of 16 samples were collected during the reporting period. The pH, EC and SWL trends for 2017 to 2020 for Hunter River Alluvium groundwater bores are shown in **Figure 42** to **Figure 52**. Trigger tracking results are shown in **Table 6.20**. Bore OH787 recorded EC levels above the trigger throughout 2020. An investigation was completed with a change to the sampling methodology implemented in 2019 from considered the cause of the measured increase in EC.

Over 2020, all of the Hunter River Alluvium bores showed stable SWL results consistent with historical trends.

TABLE 6.18 HUNTER RIVER ALLUVIUM GROUNDWATER 2020 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
OH787	29/03/2020	**EC – 95th percentile**	Watching Brief*
	26/06/2020		Investigation undertaken. Results trending back within trigger levels following recent rainfall.
	24/09/2020		Investigation Commenced
	17/12/2020		Investigation undertaken. A change to the sampling methodology implemented in 2019 i.e. low flow pumping/purging prior to all sampling and analysis, is considered the cause of the measured increase in EC.
OH788	27/03/2020	**EC – 95th percentile**	Investigation Undertaken. Monitoring results back within trigger limits following recent rainfall.
	21/09/2020		Watching Brief*
	15/12/2020		Watching Brief*
OH786	26/06/2020	**pH – 95th percentile**	pH returned to within trigger limits for the September 2020 sample.

** = 1st/2nd trigger. Watching Brief established pending outcomes of subsequent monitoring events. No specific actions required*

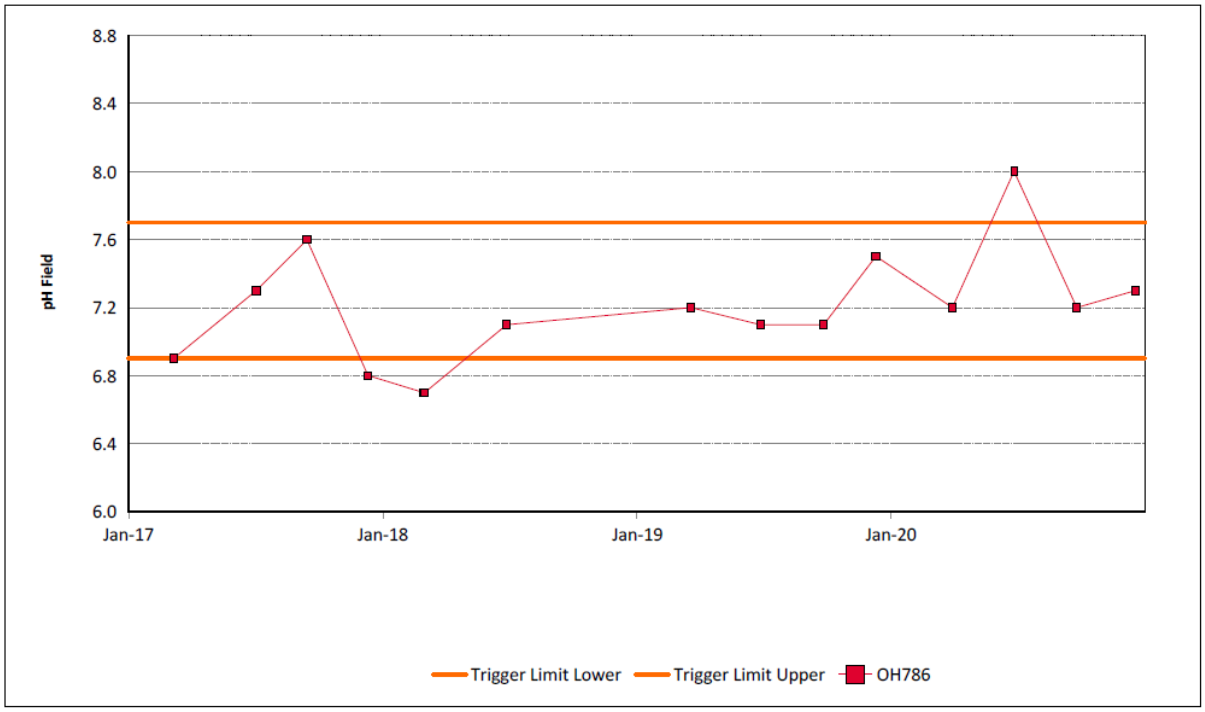


FIGURE 42: HUNTER RIVER ALLUVIUM BORE OH786 PH TREND 2017 TO 2020

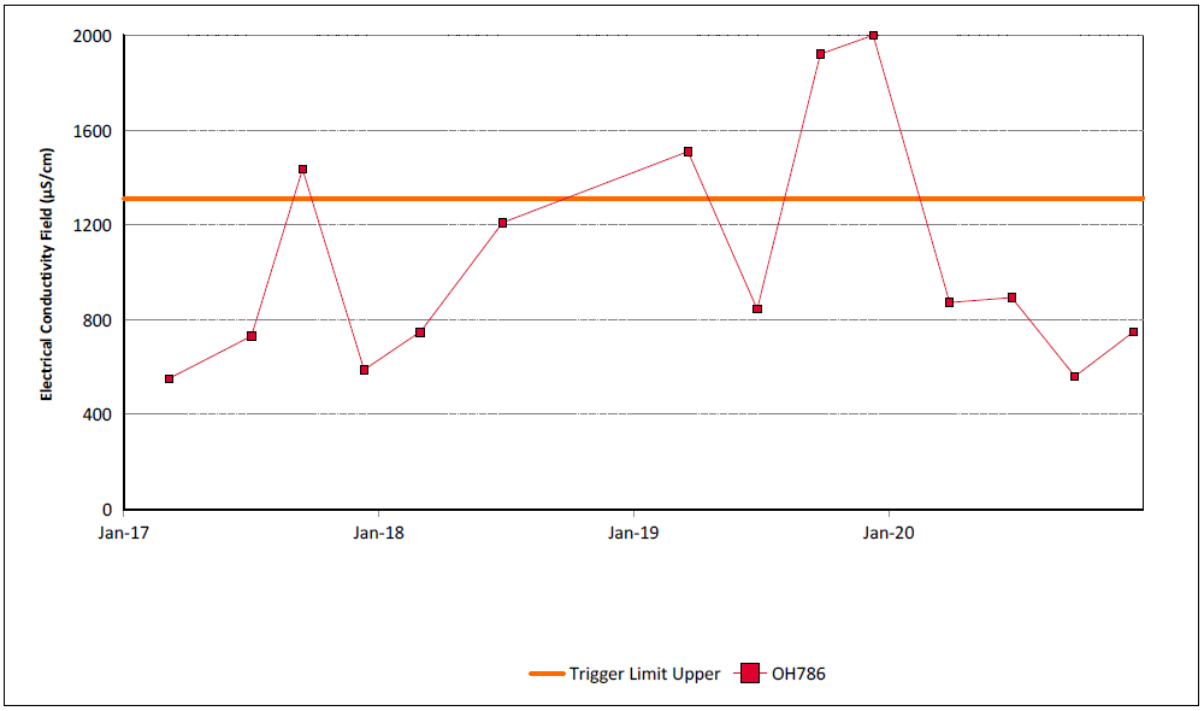


FIGURE 43: HUNTER RIVER ALLUVIUM BORE OH786 EC TREND 2017 TO 2020

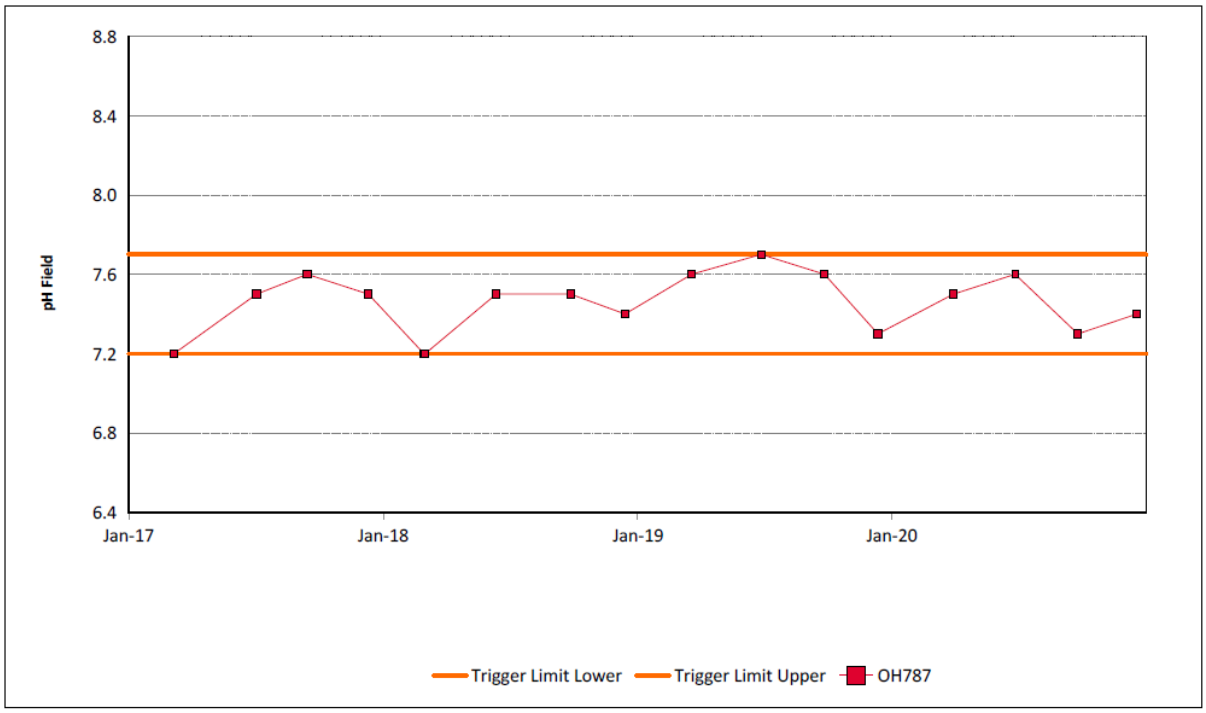


FIGURE 44: HUNTER RIVER ALLUVIUM BORE OH787 PH TREND 2017 TO 2020

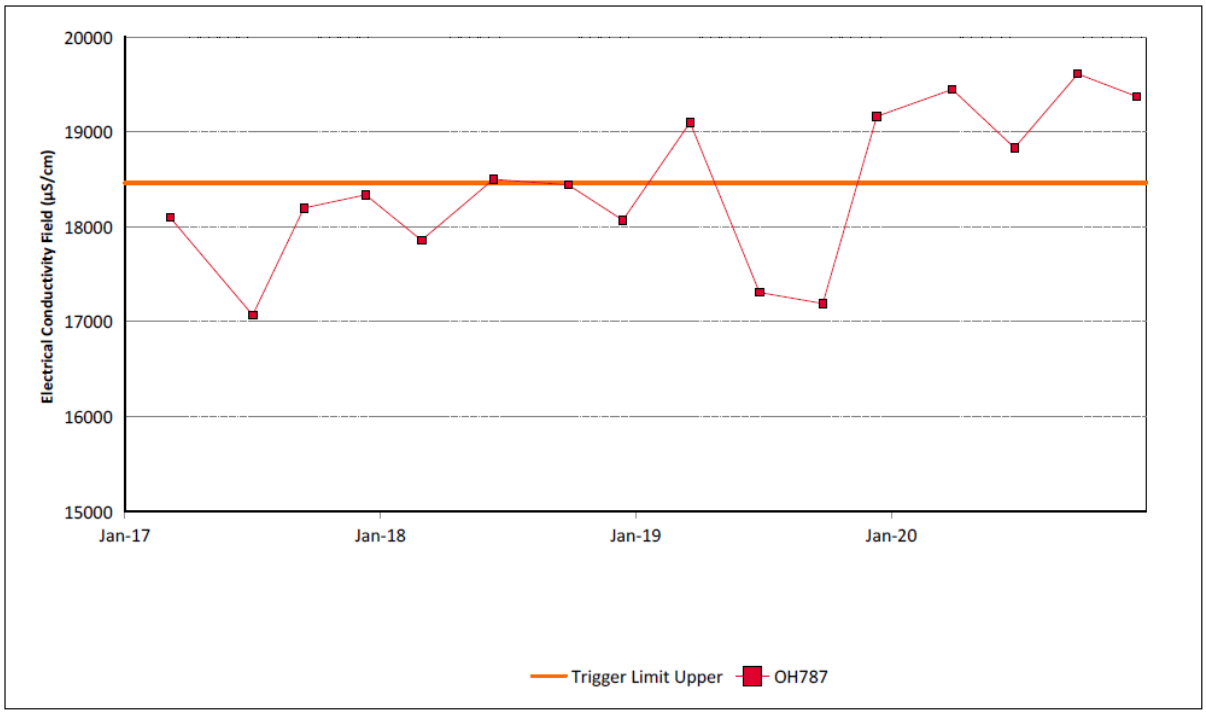


FIGURE 45: HUNTER RIVER ALLUVIUM BORE OH787 EC TREND 2017 TO 2020

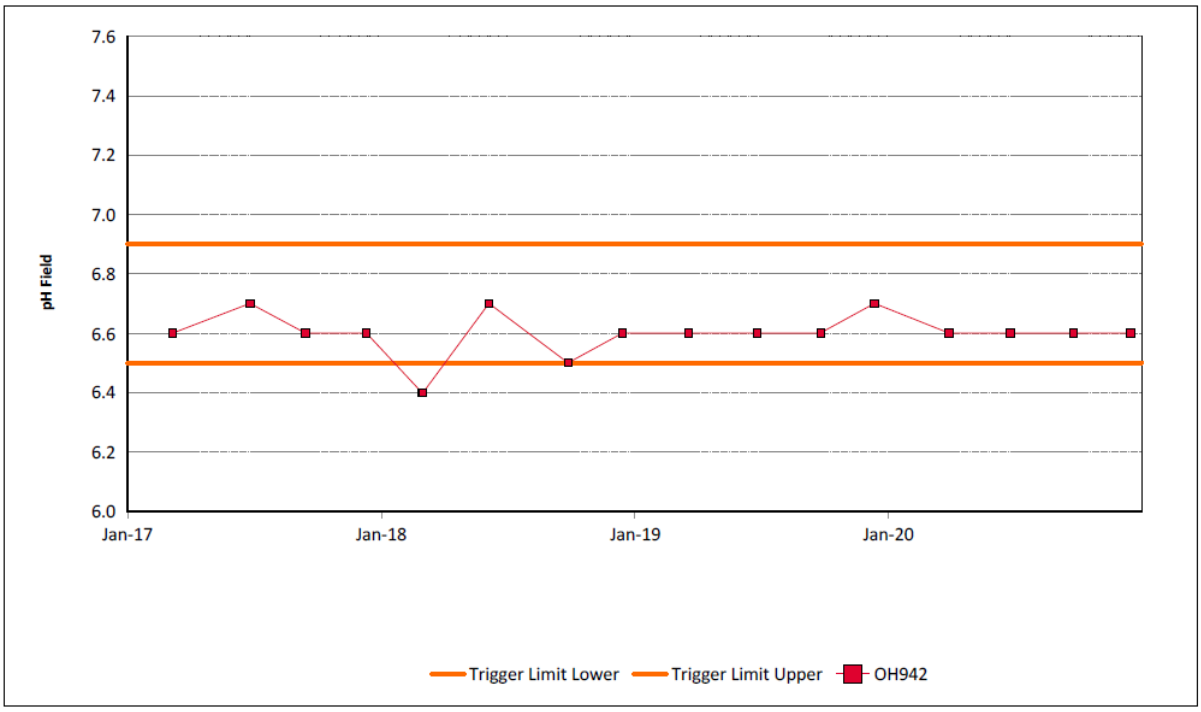


FIGURE 46: HUNTER RIVER ALLUVIUM BORE OH942 PH TREND 2017 TO 2020

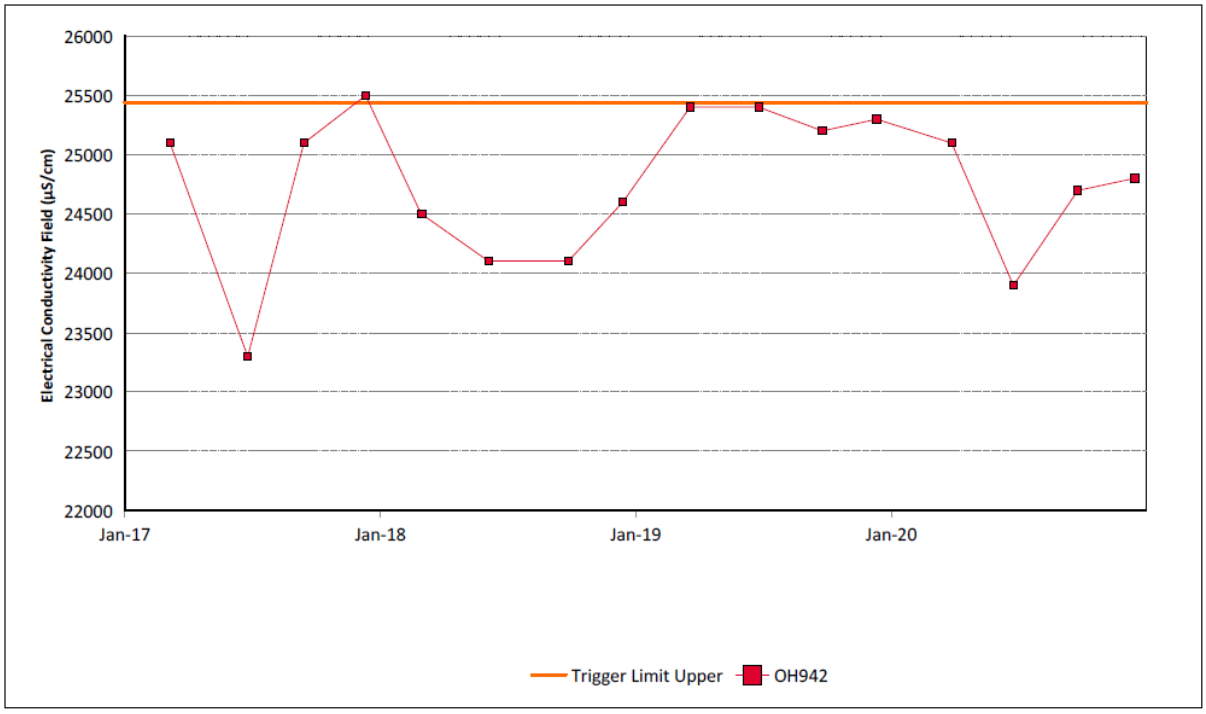
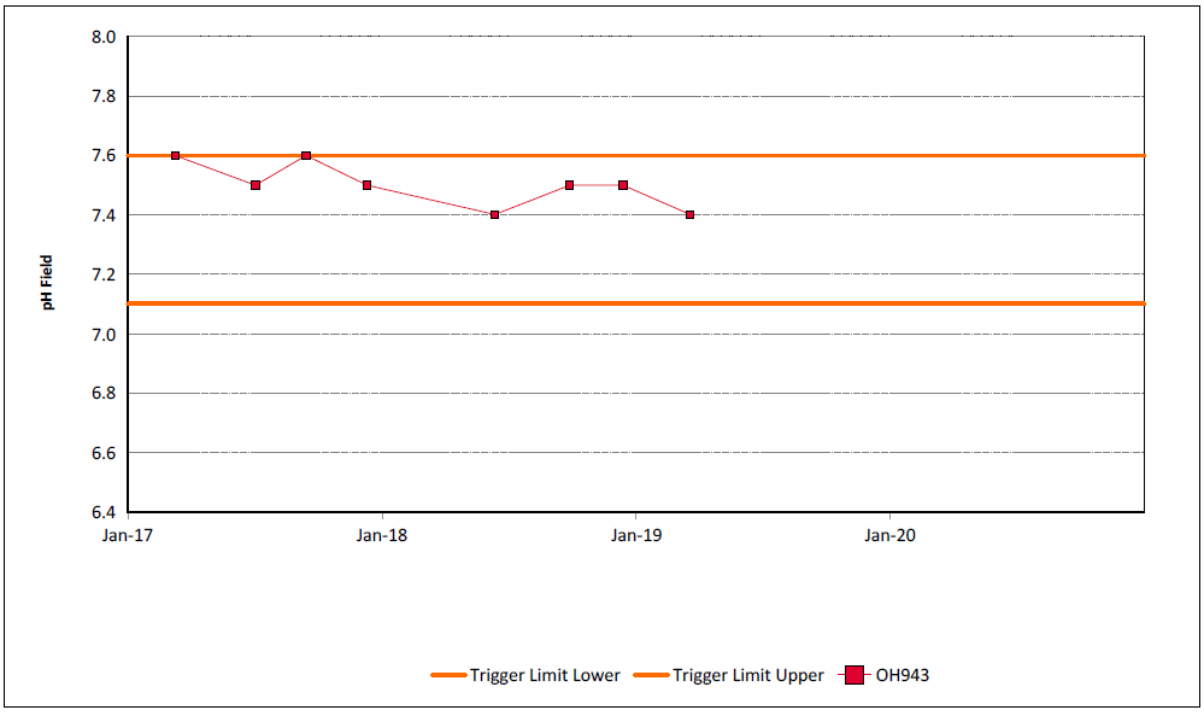
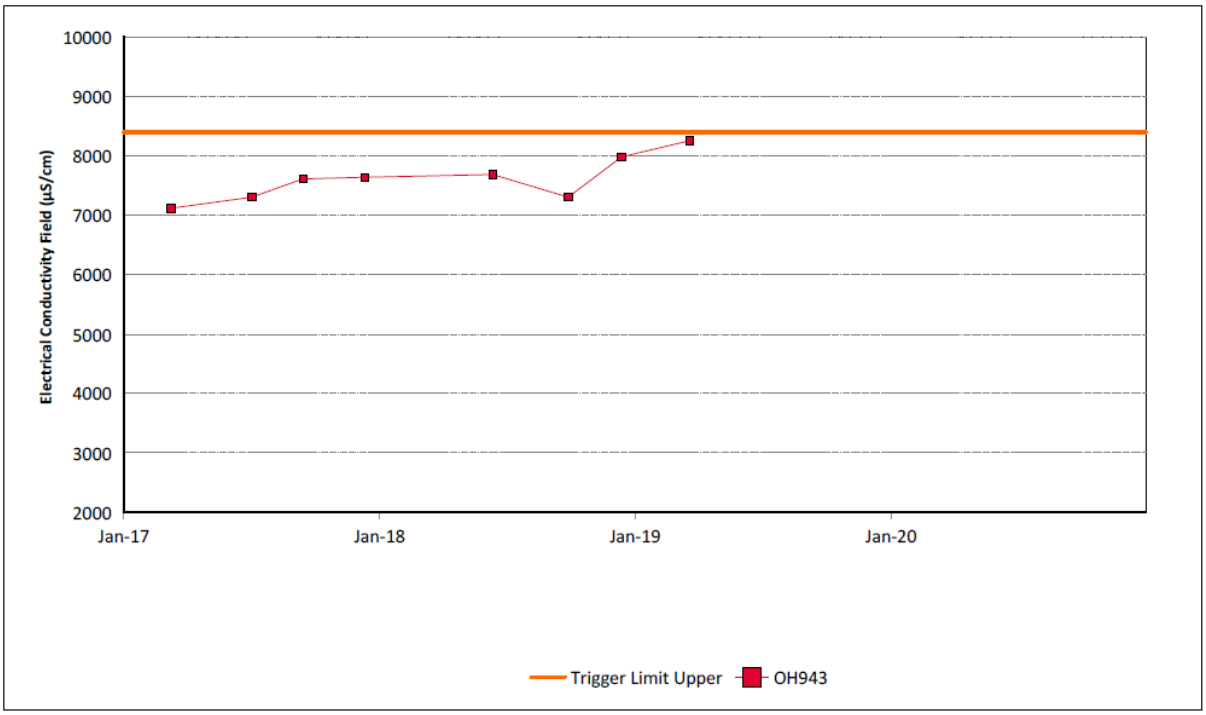


FIGURE 47: HUNTER RIVER ALLUVIUM BORE OH942 EC TREND 2017 TO 2020



Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 48: HUNTER RIVER ALLUVIUM BORE OH943 PH TREND 2017 TO 2020



Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 49: HUNTER RIVER ALLUVIUM BORE OH943 EC TREND 2017 TO 2020

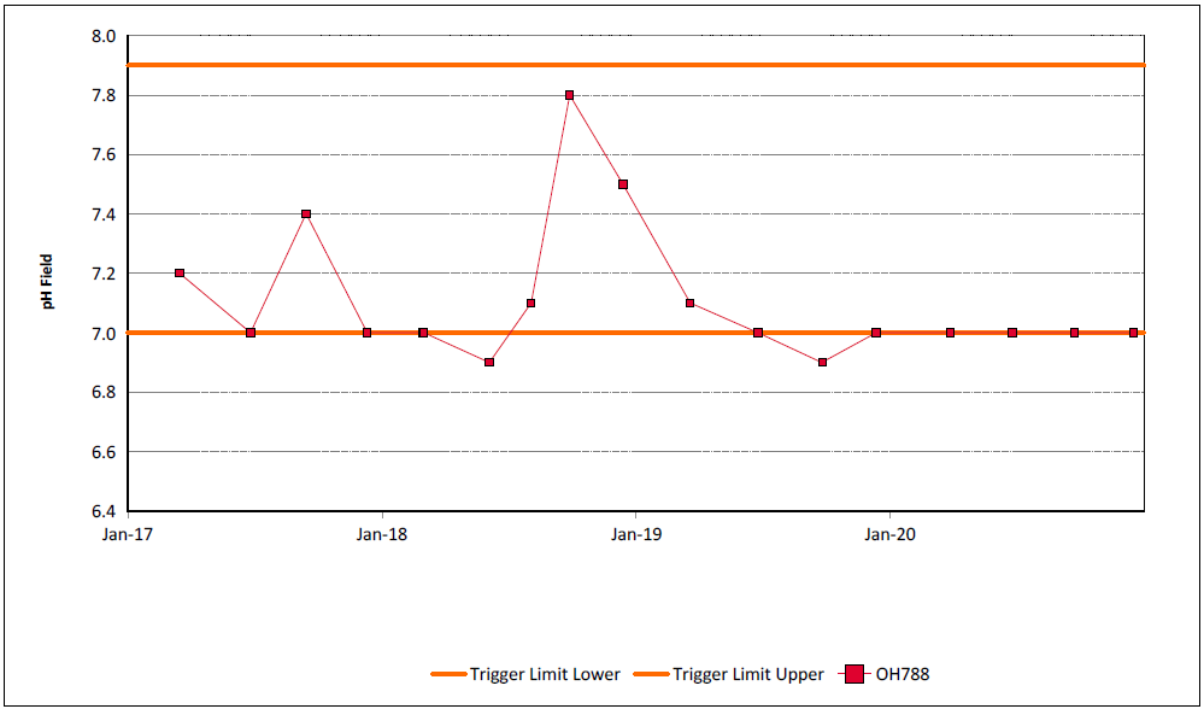


FIGURE 50: HUNTER RIVER ALLUVIUM BORE OH788 PH TREND 2017 TO 2020

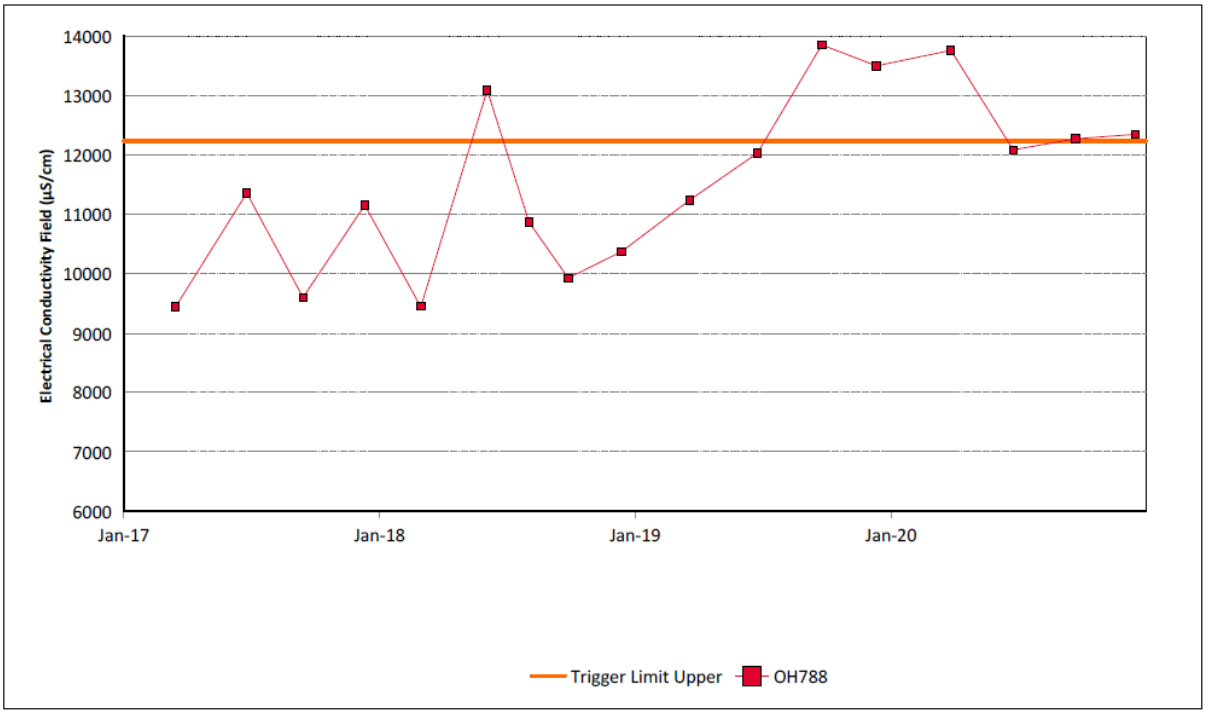


FIGURE 51: HUNTER RIVER ALLUVIUM BORE OH788 EC TREND 2017 TO 2020

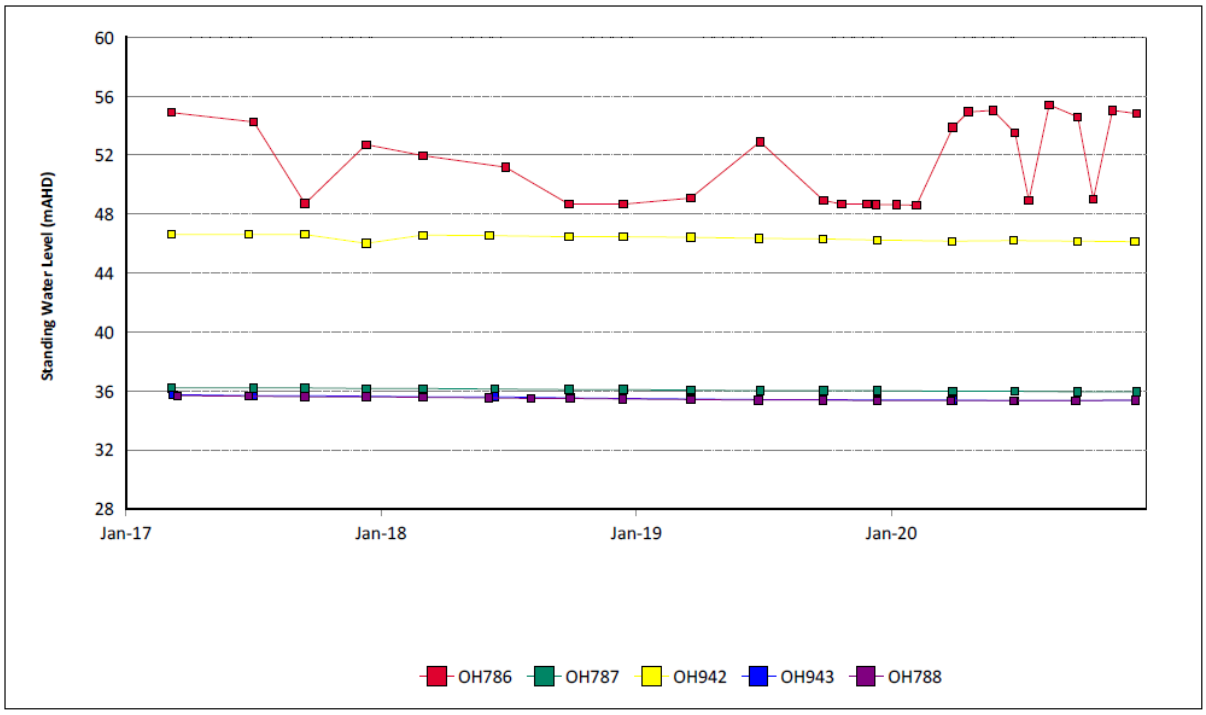


FIGURE 52: HUNTER RIVER ALLUVIUM GROUNDWATER SWL TRENDS 2017 TO 2020

6.7.6.5 Redbank Bores

Groundwater monitoring in the Redbank seam was undertaken from four sites during 2020. A total of 16 samples were collected during the reporting period. The pH, EC and SWL trends for 2017 to 2020 for Redbank seam groundwater bores are shown in **Figure 53**, **Figure 54** and **Figure 55** respectively. Trigger tracking results are shown in **Table 6.21**. Water quality results across the Redbank seam bores were generally consistent with historical values.

A steady declining trend in SWL values at all monitoring sites continued during the reporting period. This was expected/predicted given the close proximity of the bores to MTW's operations at Warkworth which are progressing West. The depressurisation of the groundwater in this area was predicted as a result of mining.

TABLE 6.19 REDBANK SEAM GROUNDWATER 2020 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
WOH2153A	25/02/2020	pH – 95th Percentile	Investigation commenced. pH results from bore WOH2153A likely to be attributable to the declining standing water levels recorded in this bore.
	28/05/2020		Investigation commenced. pH results from bore WOH2153A likely to be attributable to the declining standing water levels recorded in this bore.
	25/08/2020		Investigation completed. pH results likely to be attributable to the declining standing water levels recorded in this bore. Monitoring results back within trigger limits for November 2020 sample round.

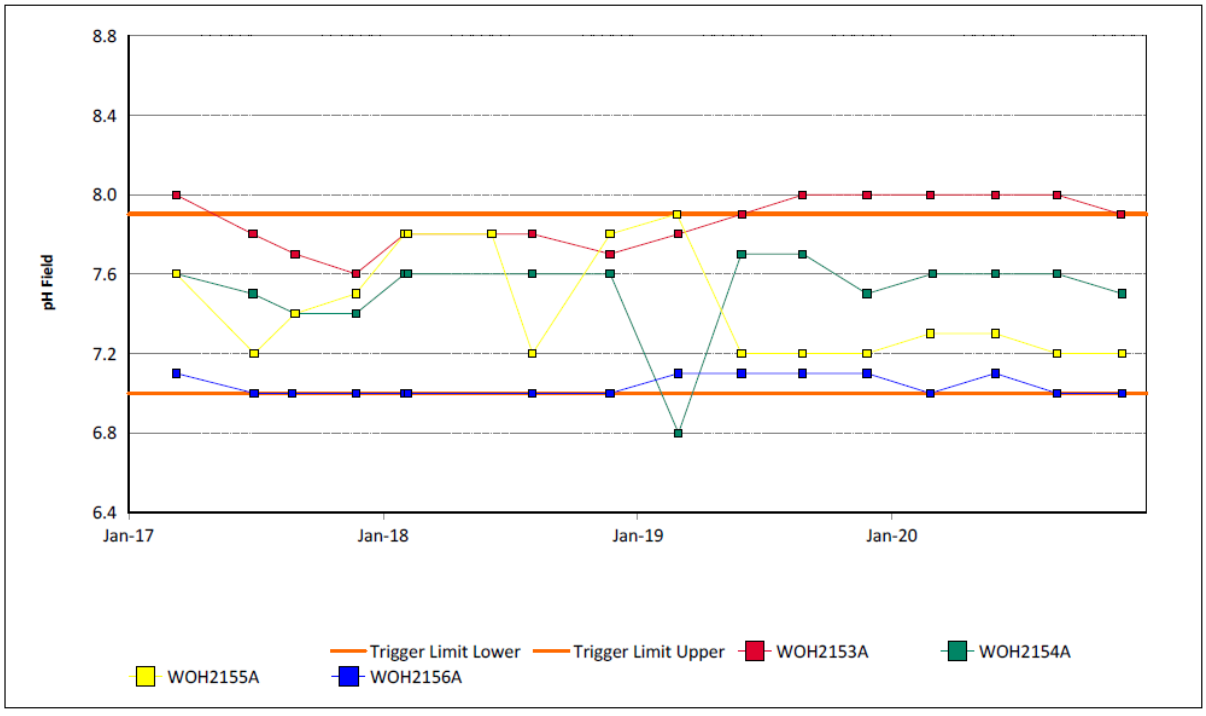


FIGURE 53: REDBANK SEAM GROUNDWATER PH TRENDS 2017 TO 2020

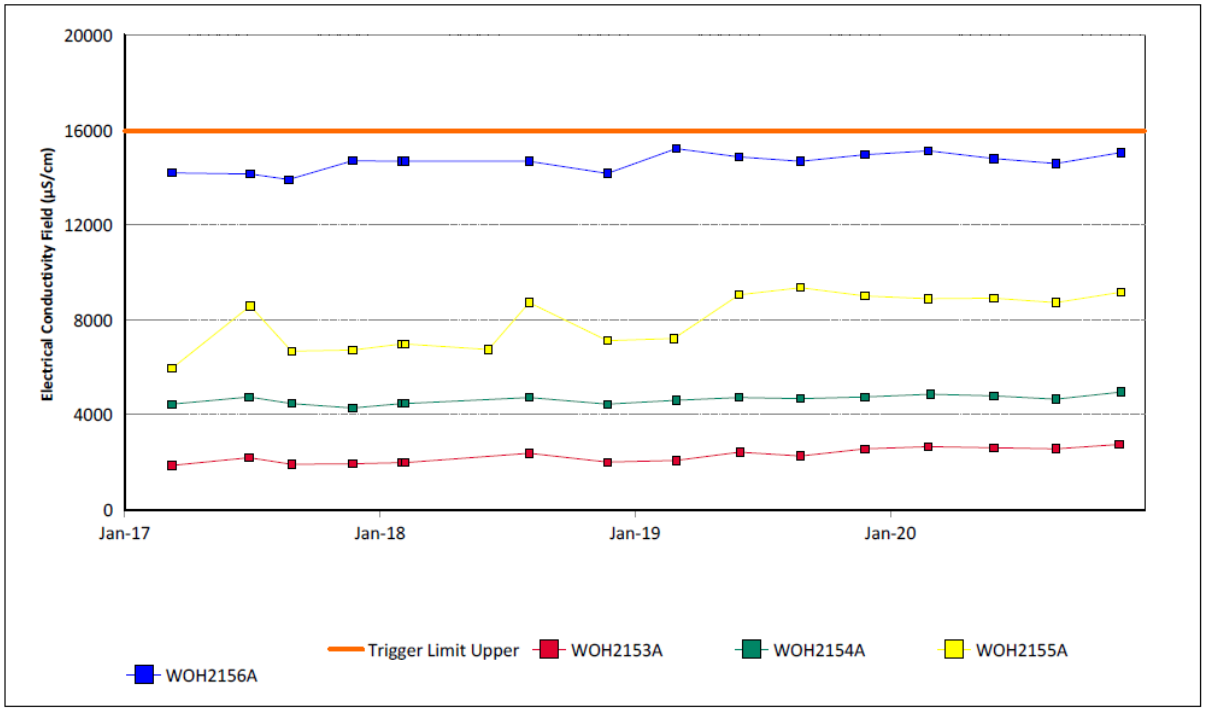


FIGURE 54: REDBANK SEAM GROUNDWATER EC TRENDS 2017 TO 2020

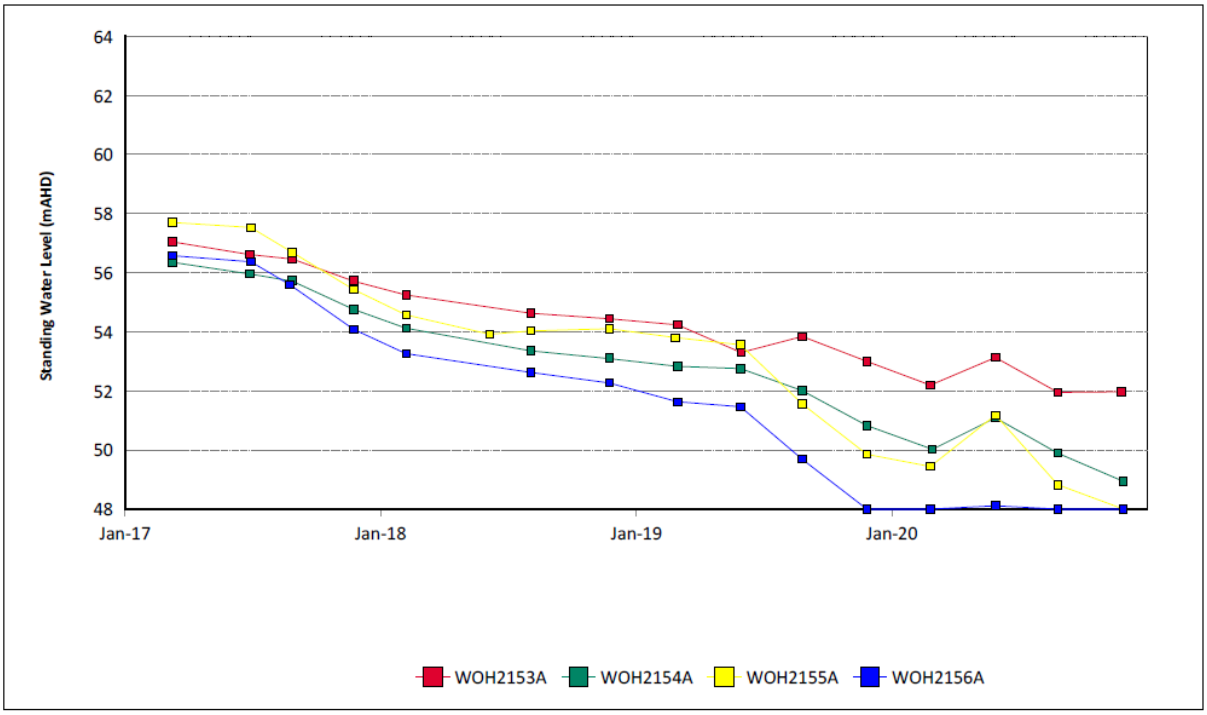


FIGURE 55: REDBANK SEAM GROUNDWATER SWL TRENDS 2017 TO 2020

6.7.6.6 Shallow Overburden Bores

Groundwater monitoring in the Shallow Overburden bores was undertaken from ten sites during 2020. A total of 40 samples were collected during the reporting period. The pH, EC and SWL trends for 2017 to 2020 for Shallow Overburden groundwater bores are shown in **Figure 56**, **Figure 57** and **Figure 58** respectively. Trigger tracking results are shown in **Table 6.22**.

Water levels and water quality were generally in line with historical values across these bores during the reporting period. Groundwater level trends for bores within the shallow overburden material showed stable to slightly declining groundwater levels. The exception to this were bores MTD616P in which slightly increasing groundwater levels were recorded followed by stabilisation and a decline. No land use changes or activities are known to have occurred near the bores that may have caused this rising trend. Further investigation into site conditions around MTD616P will be undertaken to confirm this during the 2021 reporting period.

TABLE 6.20 SHALLOW OVERBURDEN SEAM GROUNDWATER 2020 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
MTD605P	26/02/2020	EC – 95th percentile	Watching Brief*
	25/05/2020		Investigation undertaken. Results trending back within trigger levels following recent rainfall.
	24/08/2020		Investigation completed. Data consistent with historical results within bore MTD650P. Trigger limits are established for all bores within the seam. MTD605P, expresses localised variation with data consistent with historical results
MTD616P	25/02/2020	pH – 5th percentile	Investigation Undertaken. Historically, fluctuations in pH at this location coincide with changes to the sampling methodology, from quarterly grab sampling to low flow pumping/purging prior to annual comprehensive sampling and analysis. A change to the sampling methodology implemented in 2019 i.e. low flow pumping/purging prior to all sampling and analysis, is considered the cause of the measured drop in pH. pH has returned to within lower pH trigger limit in May 2020 sample event
	23/11/2020		Watching Brief*
MB15MTW01D	27/02/2020	pH – 5th percentile	Watching Brief*
	27/05/2020		Investigation Commenced
	26/08/2020		Investigation commenced. A change to the sampling methodology implemented in 2019 i.e. low flow pumping/purging prior to all sampling and analysis, is possibly considered the cause of the measured drop in pH results.
	25/11/2020		Investigation commenced. Consultant engaged to complete bore lithology and confirm aquifer representation. Depending on finding, further investigation maybe required.

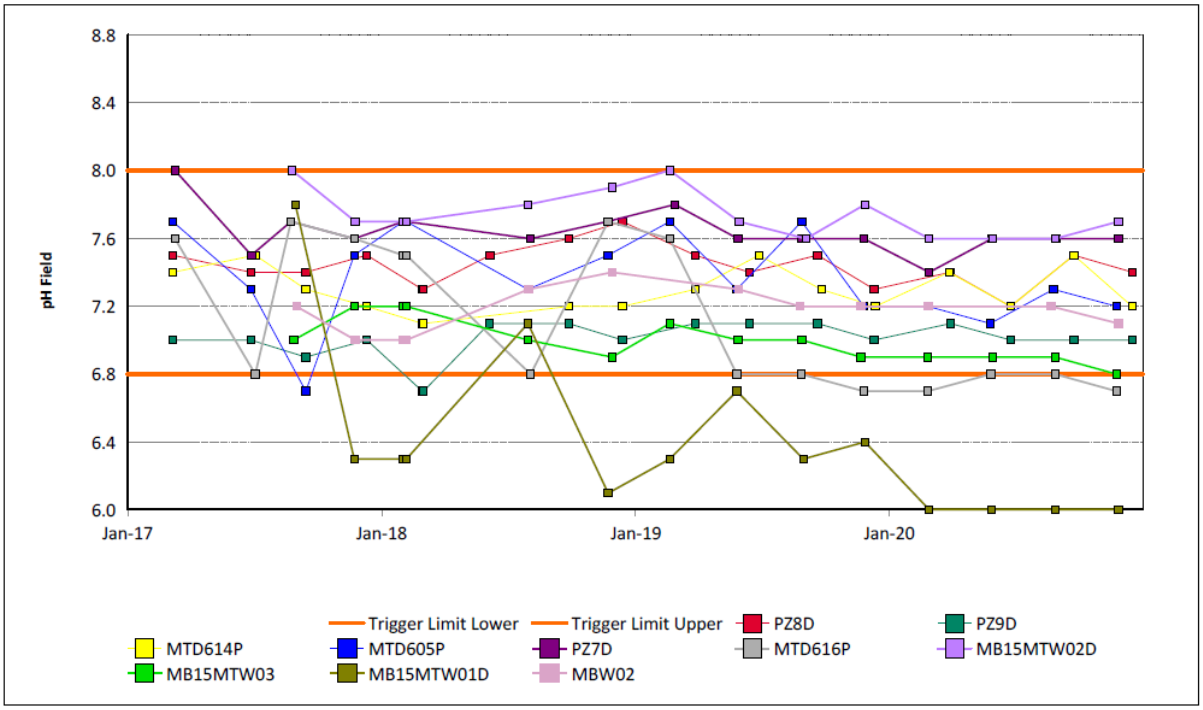


FIGURE 56: SHALLOW OVERBURDEN SEAM GROUNDWATER PH TRENDS 2017 TO 2020

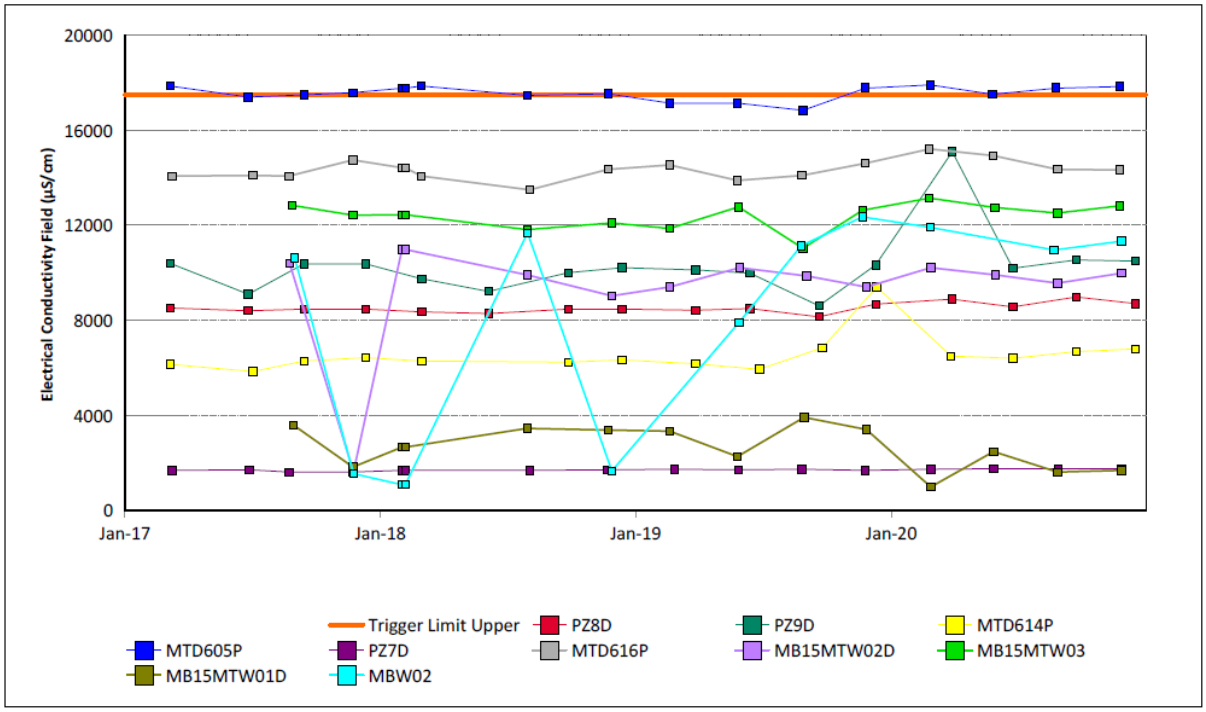


FIGURE 57: SHALLOW OVERBURDEN SEAM GROUNDWATER EC TRENDS 2017 TO 2020

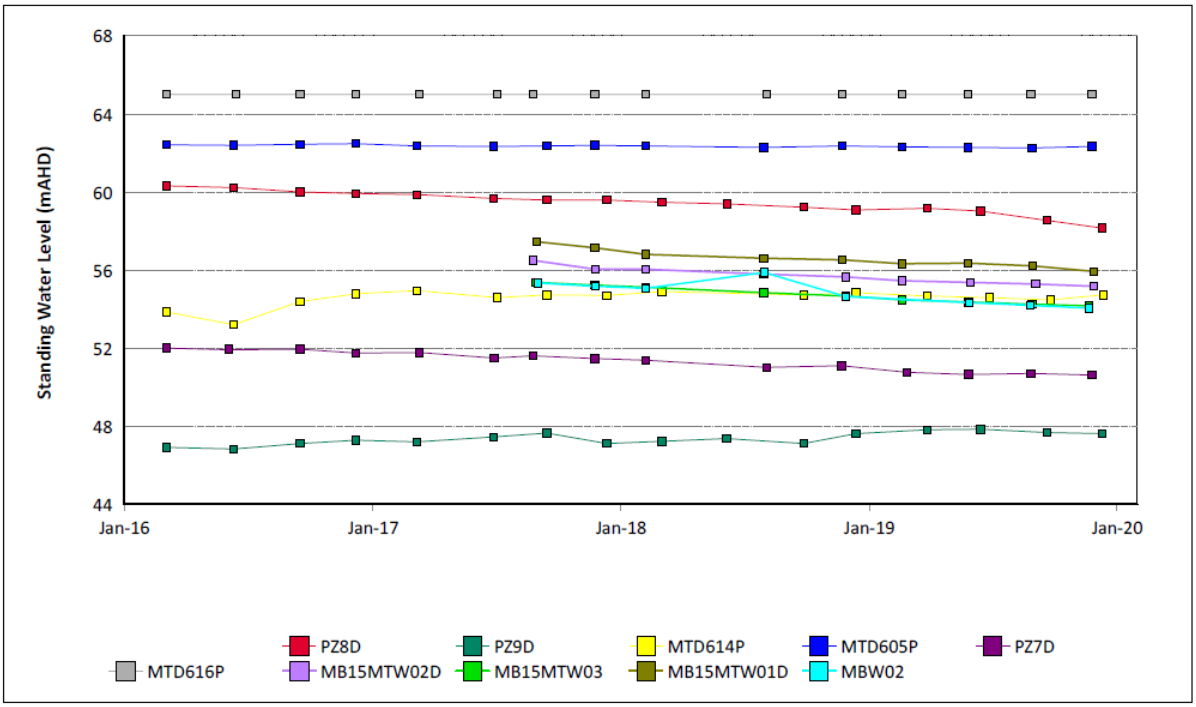


FIGURE 58: SHALLOW OVERBURDEN SEAM GROUNDWATER SWL TRENDS 2017 TO 2020

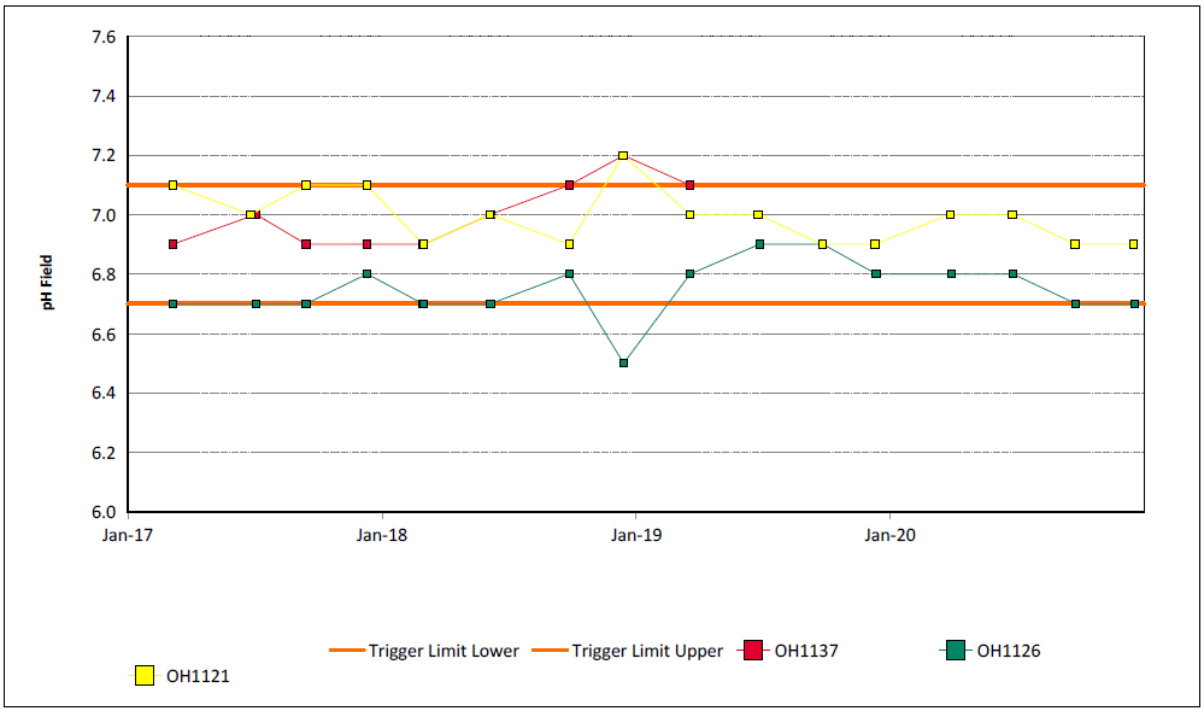
6.7.6.7 Vaux Seam Bores

Groundwater monitoring in the Vaux Seam was undertaken from three sites during 2020; a total of 8 samples were collected. The pH, EC and SWL trends for 2017 to 2020 for Vaux groundwater bores are shown in **Figure 59**, **Figure 60** and **Figure 61** respectively.

Historical groundwater level trends for the Vaux seam bores show that over 2020 groundwater elevations within the Vaux Seam, north of North Pit, (OH1126) ranged between 45.71 mAHD and 46.01 mAHD. OH1137 has remained dry since September 2019 onwards. These trends are similar to trends observed within the Warkworth Seam, which may relate to depressurisation of the coal seams below the actively mined seams at MTW, or due to surrounding mine operations that target the Vaux Seam.

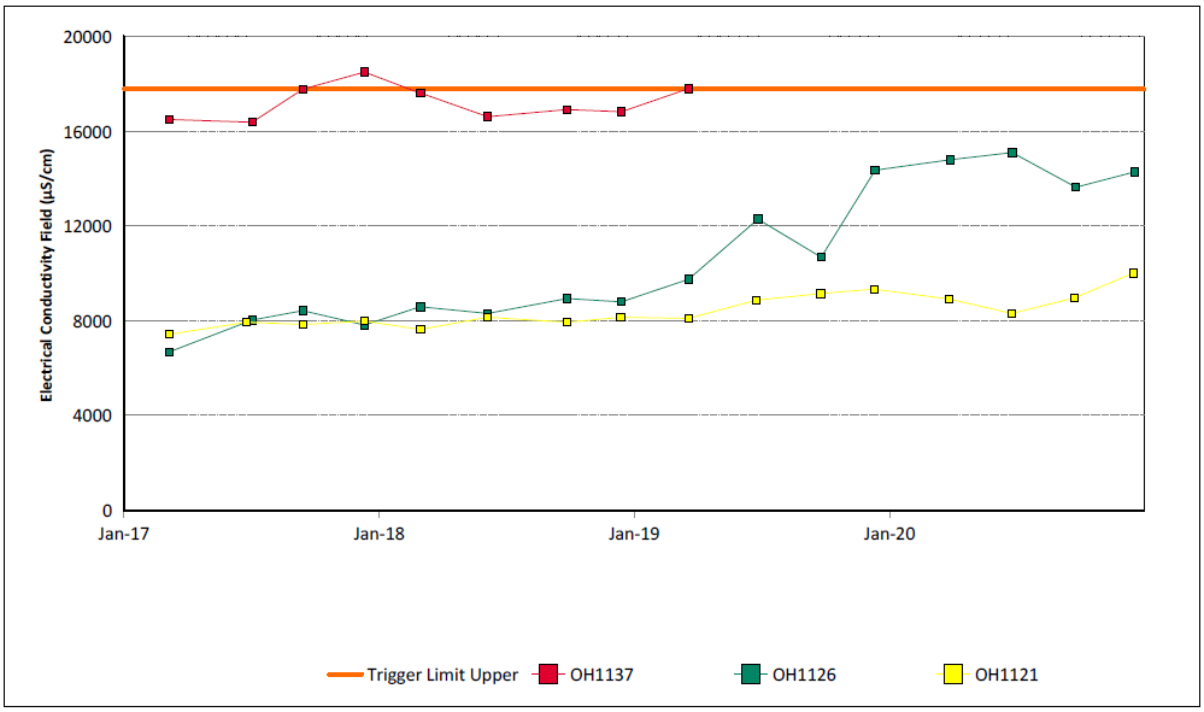
Groundwater levels within bore OH1121 remained stable over 2020.

The bores record a general decline in groundwater levels since 2008, while the model predicted a rise in groundwater levels. This difference may relate to how the model replicates recovery within the rehabilitated spoil at North Pit. The difference may also relate to influence of licenced groundwater abstraction from the Lemington Underground Bore that is not replicated within the model.



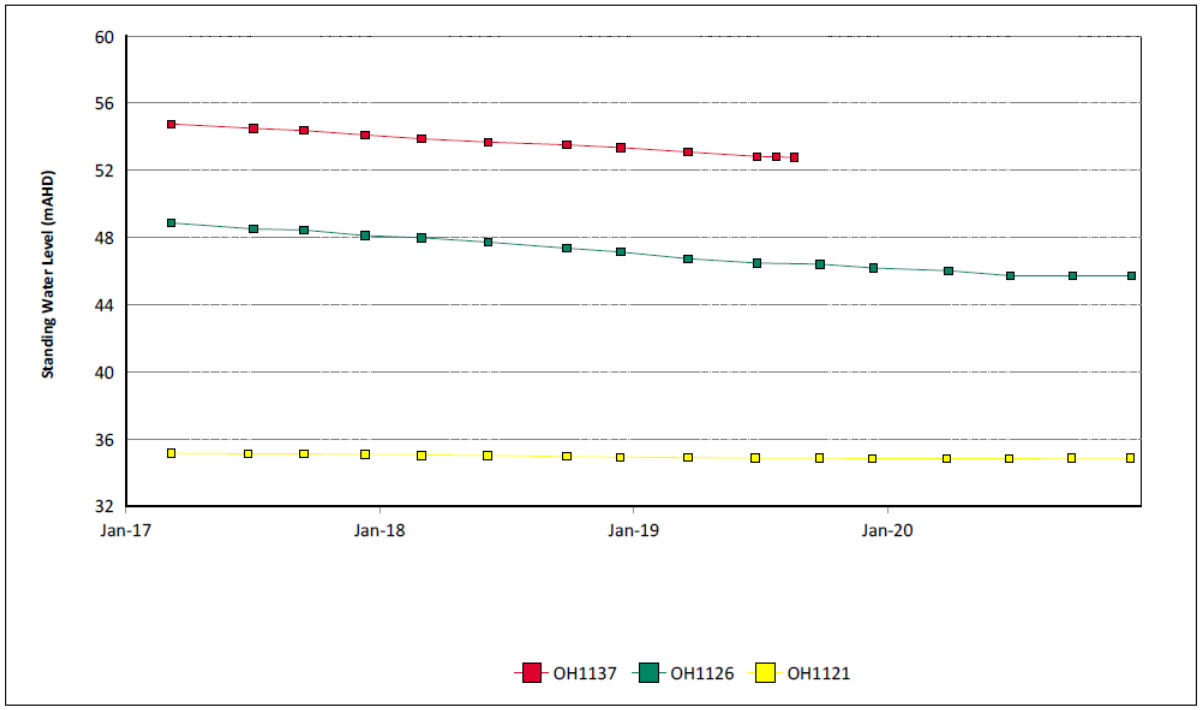
Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 59: VAUX SEAM GROUNDWATER PH TRENDS 2017 TO 2020



Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 60: VAUX SEAM GROUNDWATER EC TRENDS 2017 TO 2020



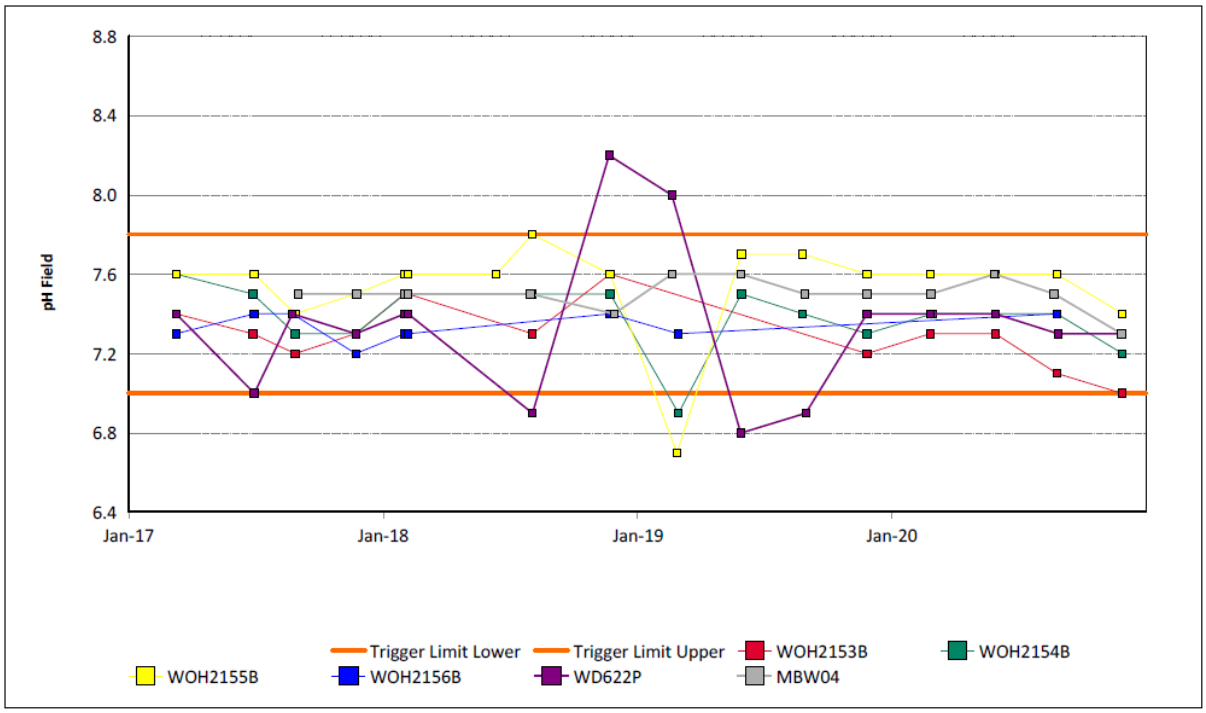
Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 61: VAUX SEAM GROUNDWATER SWL TRENDS 2017 TO 2020

6.7.6.8 Wambo Seam Bores

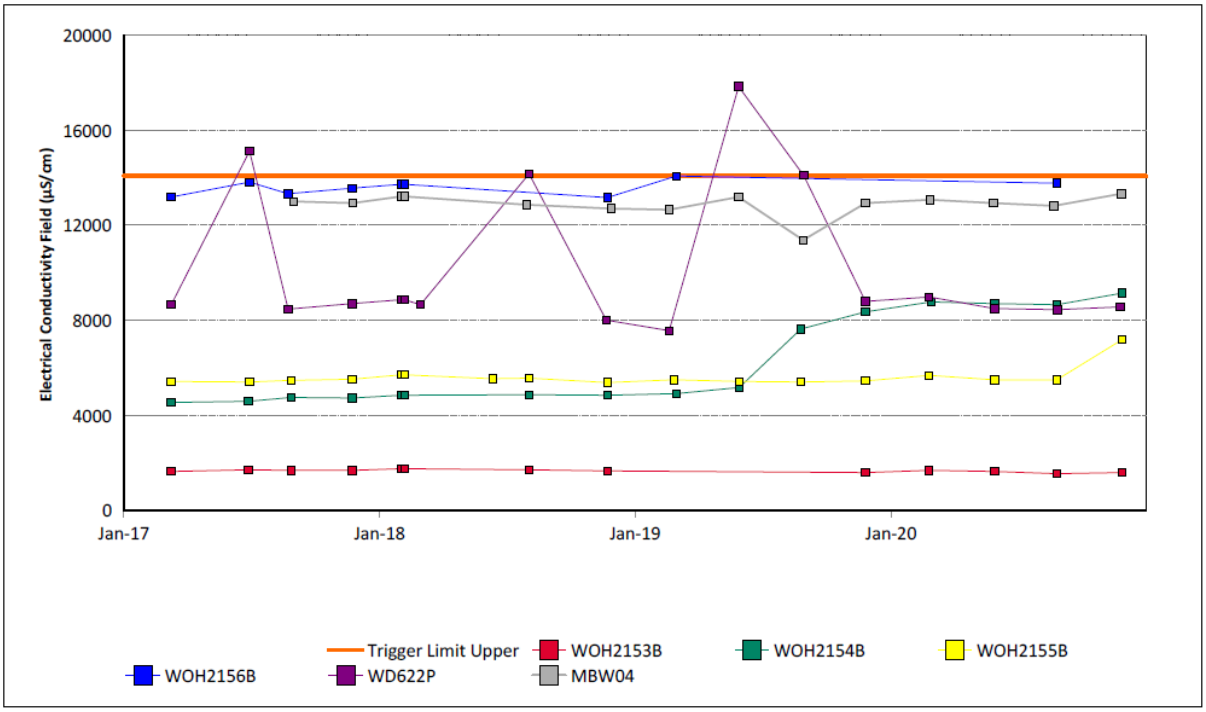
Groundwater monitoring in the Wambo Seam was undertaken from six sites during 2020. A total of 21 samples were collected during the reporting period. The pH, EC and SWL trends for 2017 to 2020 for Wambo Seam groundwater bores are shown in **Figure 62, Figure 63** and **Figure 64** respectively.

Groundwater elevations in the Wambo Seam recovered temporarily following above average rainfall in February and March 2020. Despite this temporary relief, the declining trends continued over the rest of the year as a result of coal seam depressurisation.



Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 62: WAMBO SEAM GROUNDWATER PH TRENDS 2017 TO 2020



Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 63: WAMBO SEAM GROUNDWATER EC TRENDS 2017 TO 2020

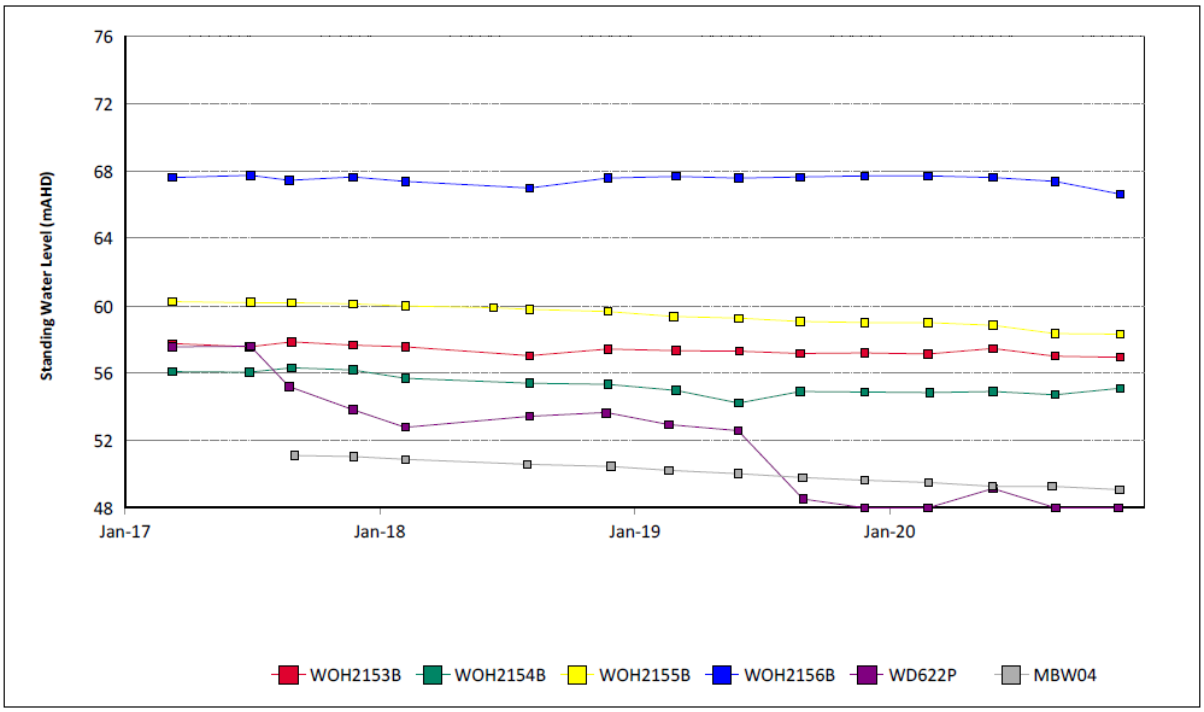


FIGURE 64: WAMBO SEAM GROUNDWATER SWL TRENDS 2017 TO 2020

6.7.6.9 Warkworth Seam Bores

Groundwater monitoring in the Warkworth Seam was undertaken from two sites during 2020; 24 samples were collected. The pH, EC and SWL trends for 2017 to 2020 for Warkworth seam bores are shown in **Figure 65**, **Figure 66** and **Figure 67** respectively. Trigger tracking results are shown in **Table 6.25**. The SWL in both bores reduced gradually over the reporting period in line with historical trends.

TABLE 6.21 WARKWORTH SEAM GROUNDWATER 2020 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
OH1138(1)	09/01/2020	pH – 5th percentile	Investigation Commenced
	06/02/2020		Investigation Commenced
	23/03/2020		Investigation Completed. As outlined in the MTW 2019 Annual Groundwater Review pH results for monitoring bore OH1138 likely to be attributable to the regional drawdown associated within the active mining in North Pit and the potential influences from the abstraction of water from the Lemington underground workings. Monthly results obtained since March 2020 (April, May and June) have confirmed pH to be back within trigger limits.
	16/07/2020		Watching Brief*
	14/08/2020		Watching Brief* Monitoring results back within trigger limits for September 2020 sample round.
	16/10/2020		Watching Brief*
	13/11/2020		Watching Brief* Monitoring results back within trigger limits for December 2020 sample round.

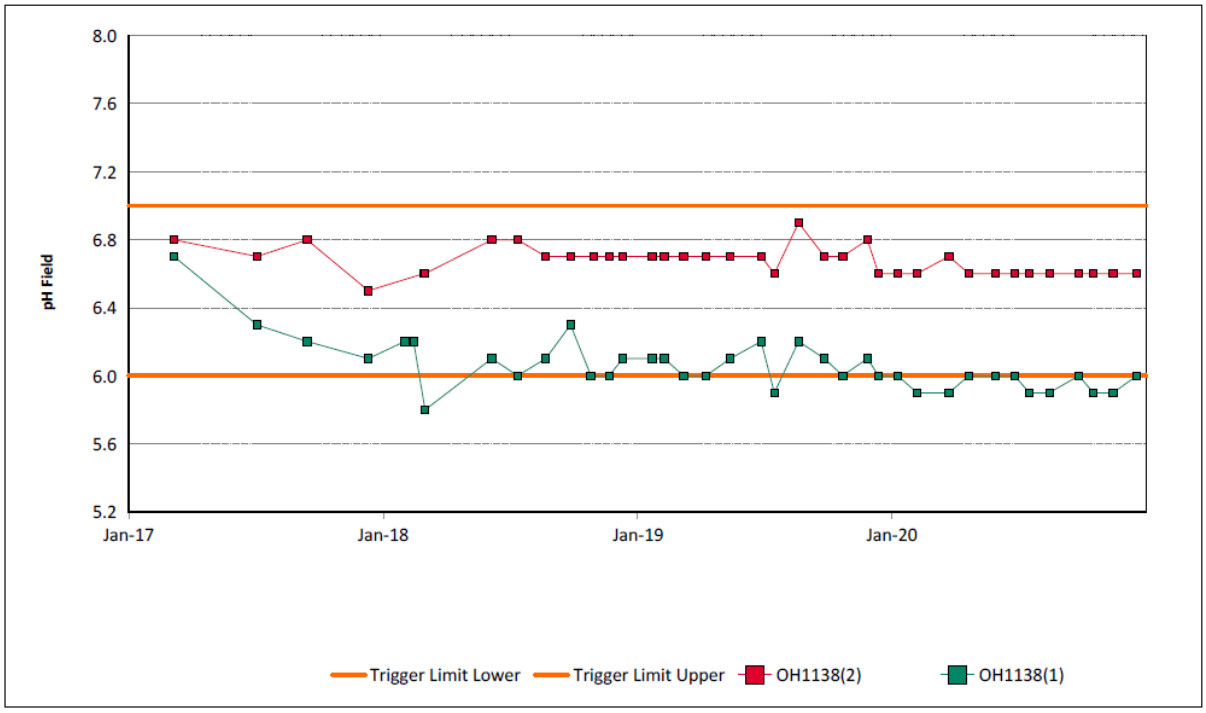


FIGURE 65: WARKWORTH SEAM GROUNDWATER PH TRENDS 2017 TO 2020

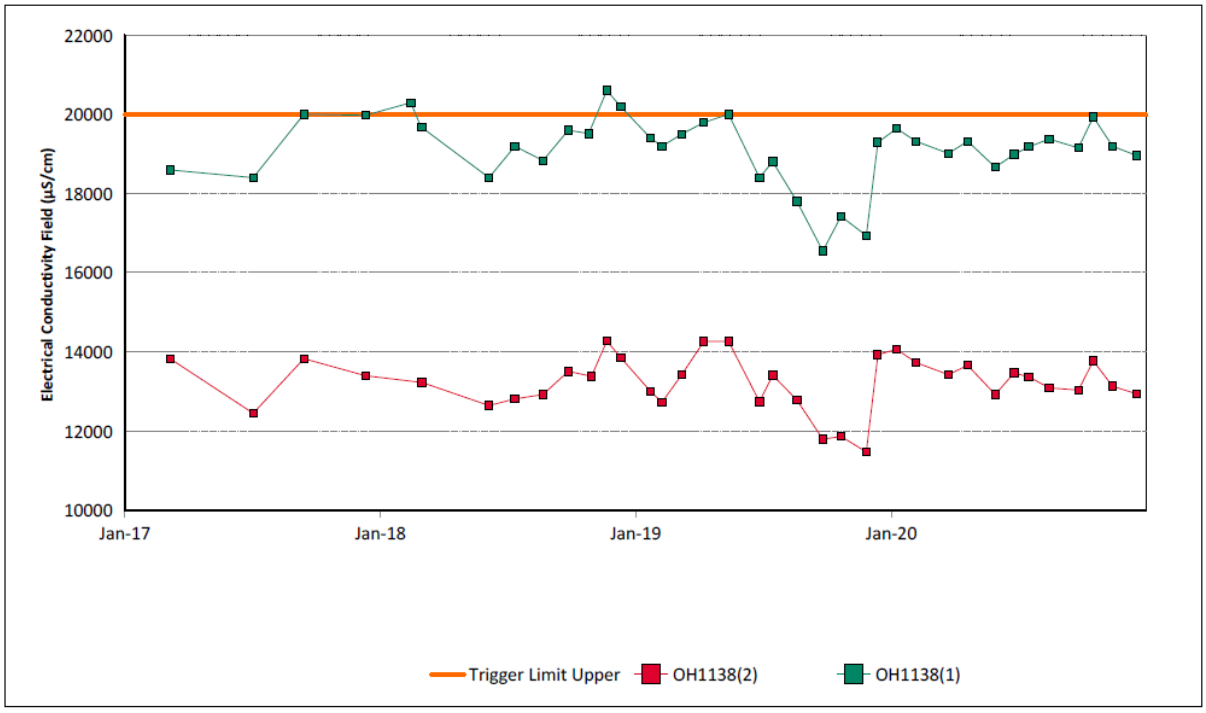


FIGURE 66: WARKWORTH SEAM GROUNDWATER EC TRENDS 2017 TO 2020

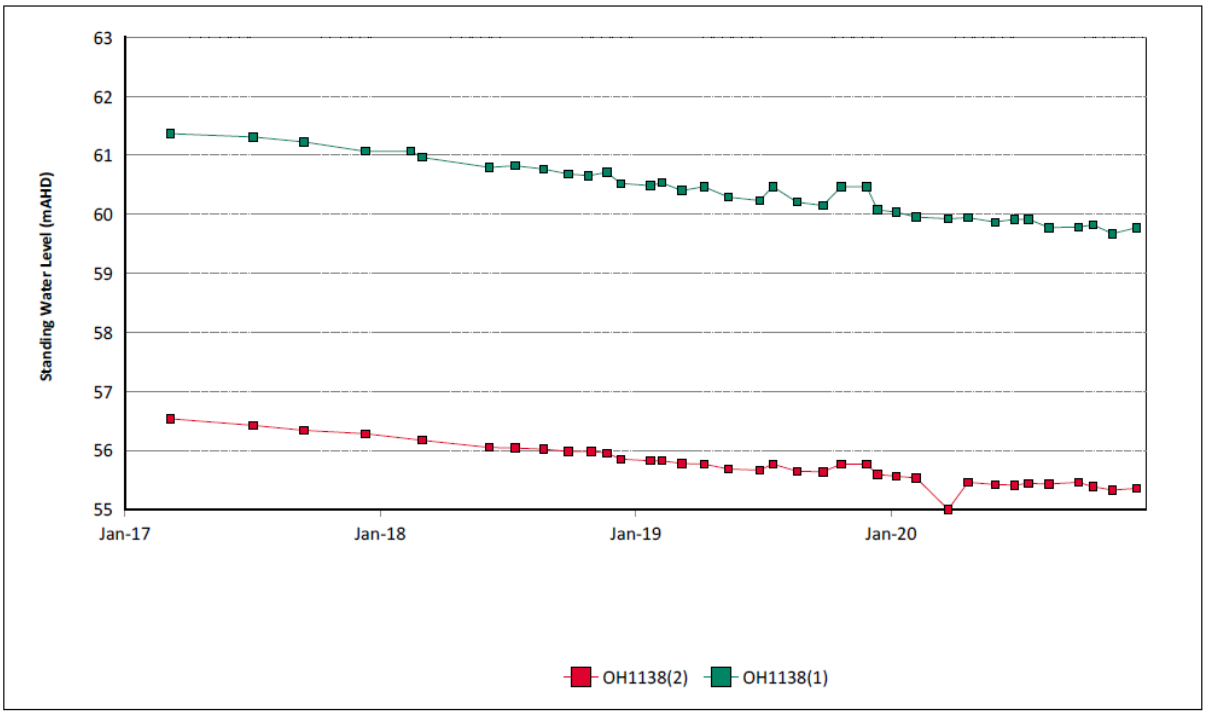


FIGURE 67: WARKWORTH SEAM GROUNDWATER SWL TRENDS 2017 TO 2020

6.7.6.10 Wollombi Brook Alluvium Bores

Groundwater monitoring in the Wollombi Brook Alluvium was undertaken from two sites during 2020; four samples were collected. The pH, EC and SWL trends for 2017 to 2020 are shown in **Figure 68** to **Figure 72** respectively. The trigger tracking result is shown in **Table 6.26**.

Over 2020 the SWL in both bores has steadily increased. The increase in water levels corresponds to the stream flow levels in the Wollombi Brook as a result of increased rainfall over the period. As outlined in **Appendix 4** the spikes in water quality across PZ8S and PZ9S are likely to be related to the bore being dry (at construction depth) and samples being influenced by localised rainwater at the base of each bore.

TABLE 6.22 WOLLOMBI BROOK ALLUVIUM GROUNDWATER 2020 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
PZ8S	22/09/2020	**EC – 95th Percentile**	Watching Brief* Monitoring results back within trigger limits for December 2020 sample round.

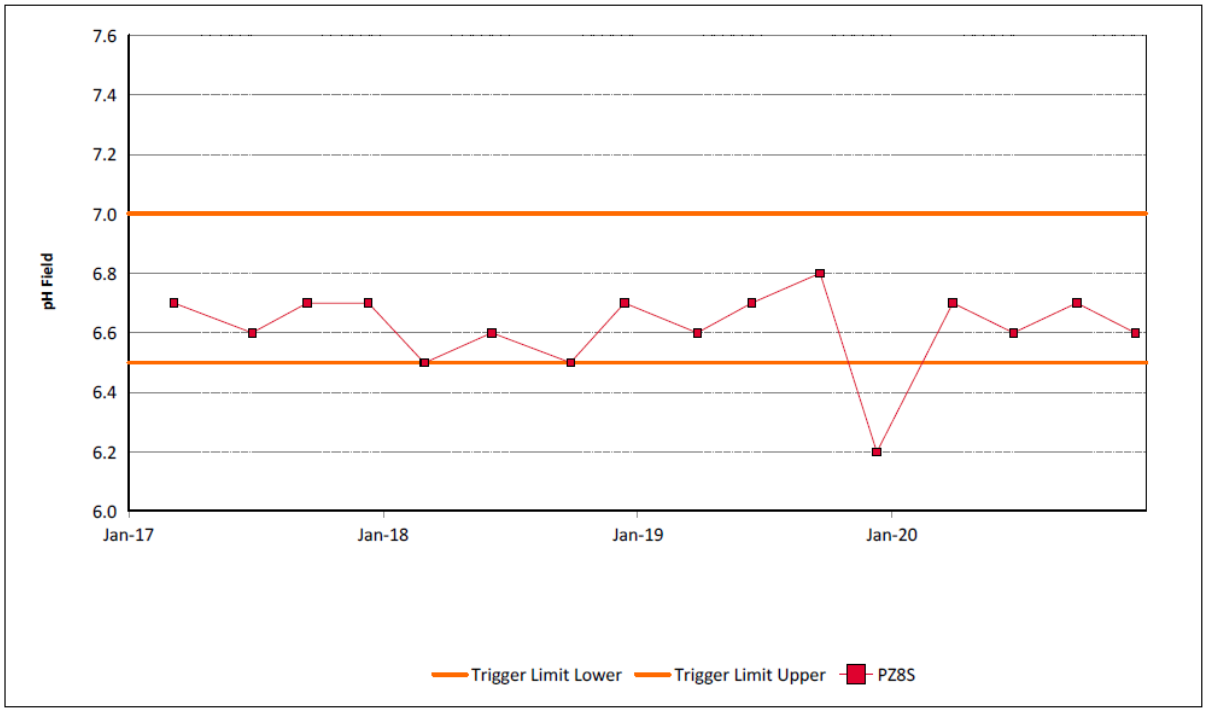


FIGURE 68: WOLLOMBI BROOK ALLUVIUM GROUNDWATER PH TRENDS 2017 TO 2020

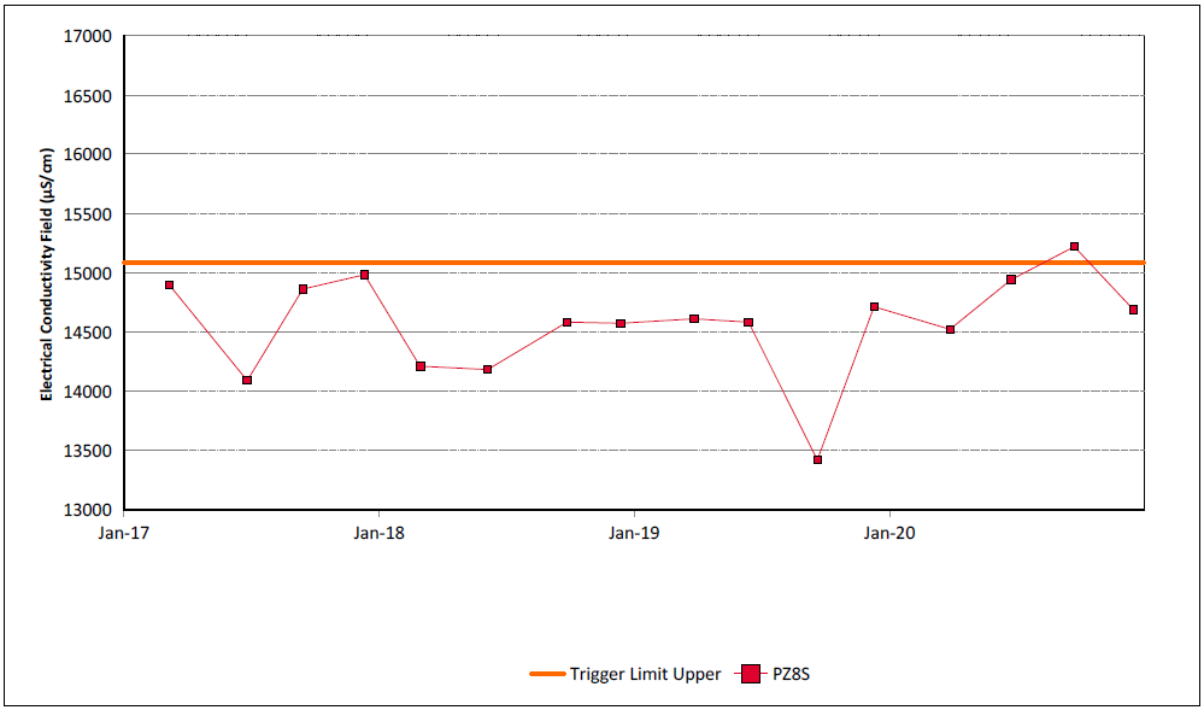
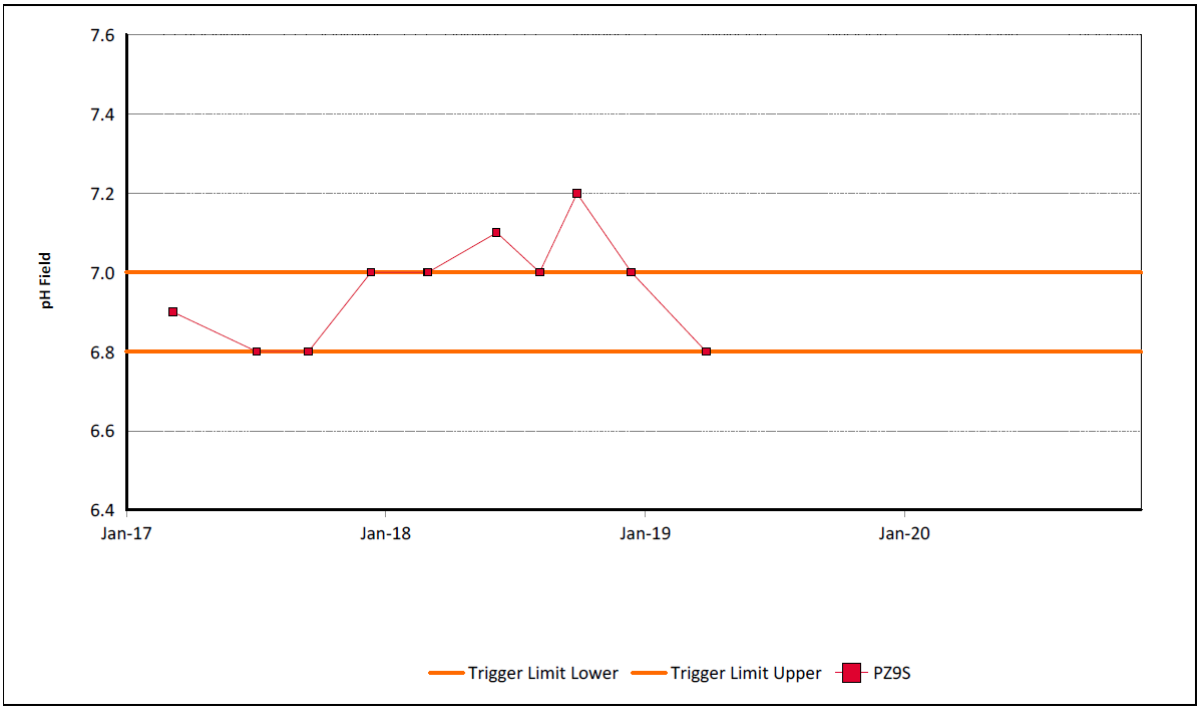
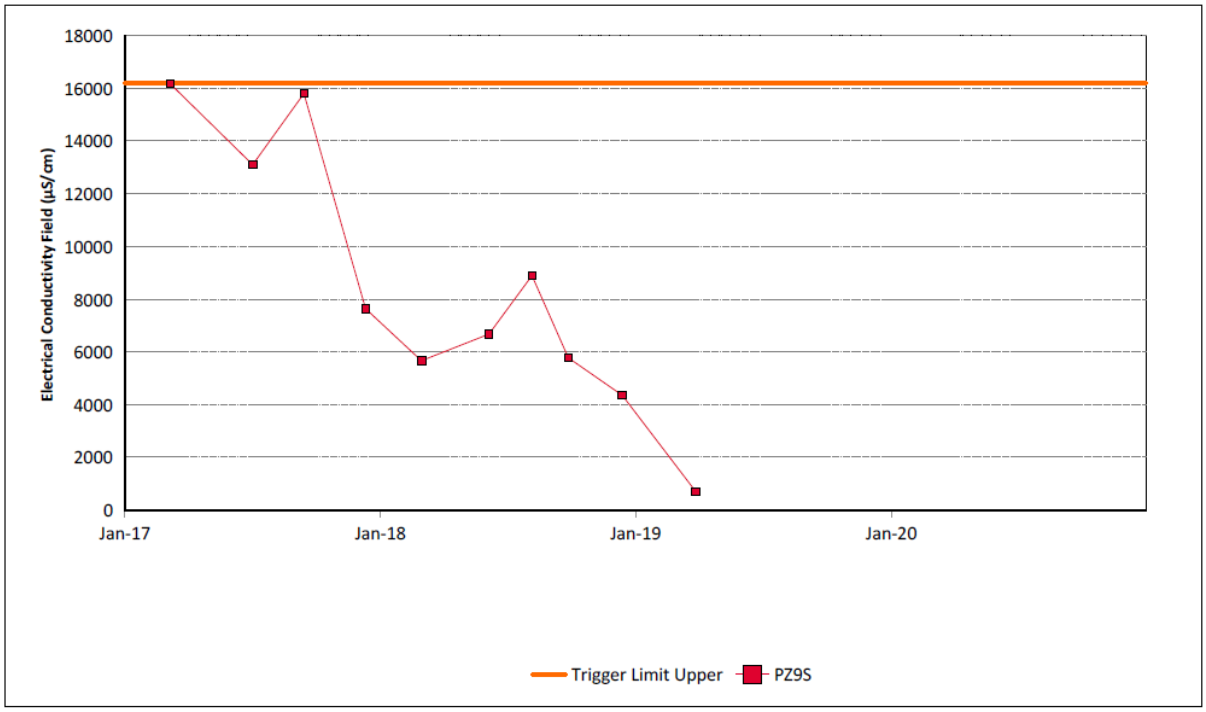


FIGURE 69: WOLLOMBI BROOK ALLUVIUM GROUNDWATER EC TRENDS 2017 TO 2020



Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 70: WOLLOMBI BROOK ALLUVIUM GROUNDWATER PH TRENDS 2017 TO 2020



Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 71: WOLLOMBI BROOK ALLUVIUM GROUNDWATER EC TRENDS 2017 TO 2020

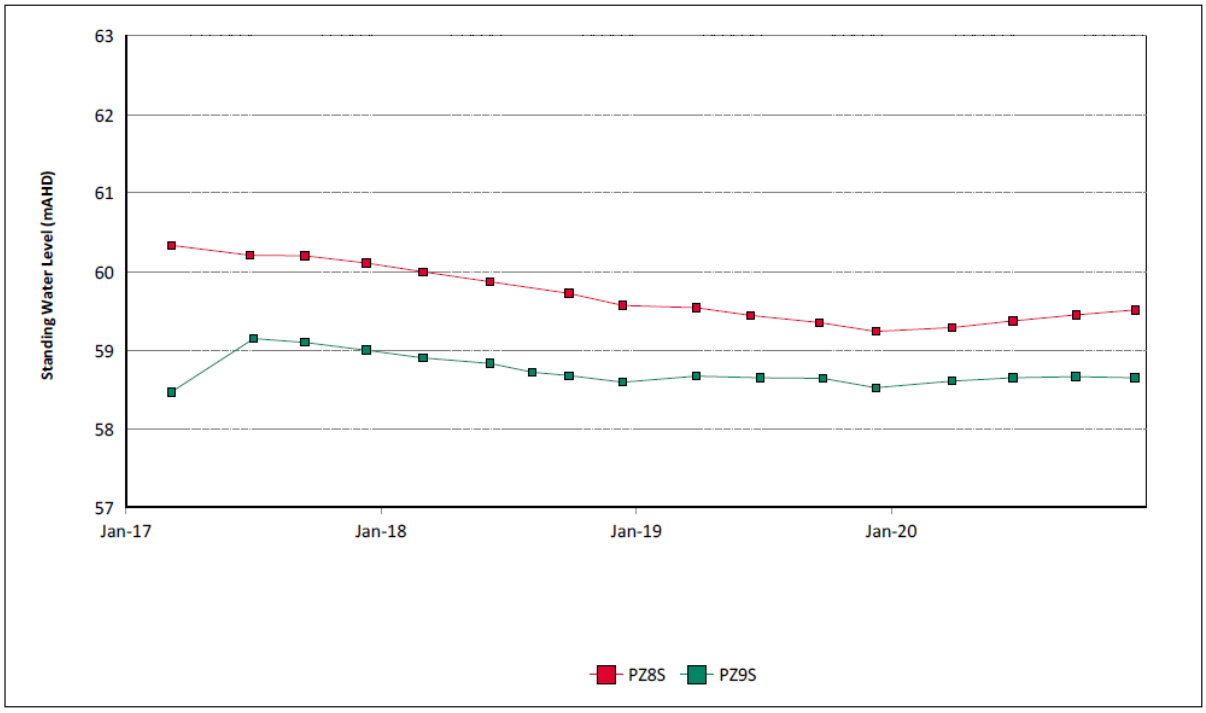


FIGURE 72: WOLLOMBI BROOK ALLUVIUM GROUNDWATER SWL TRENDS 2017 TO 2020

6.7.6.11 Woodlands Hill Seam Bores

Groundwater monitoring in the Woodlands Hill Seam was undertaken from one site during 2020; four samples were collected. The pH, EC and SWL trends for 2017 to 2020 are shown in **Figure 73** to **Figure 75** respectively. The trigger tracking result is shown in **Table 6.27**. An erroneous pH reading (outside of trigger limits) was recorded during Q1 2019. The result was not consistent with historical values and was considered to be related to a field recording error. Groundwater elevations at WD625P remained relatively similar throughout 2019 and 2020. This is likely due to the distance that these bores are from the pit.

TABLE 6.23 WOODLANDS HILL SEAM GROUNDWATER 2020 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
WD625P	28/02/2020	**EC – 95th Percentile**	Watching Brief* EC result from bore WD625P has returned within trigger limits during the June 20 sample round.
	26/11/2020		Watching Brief*

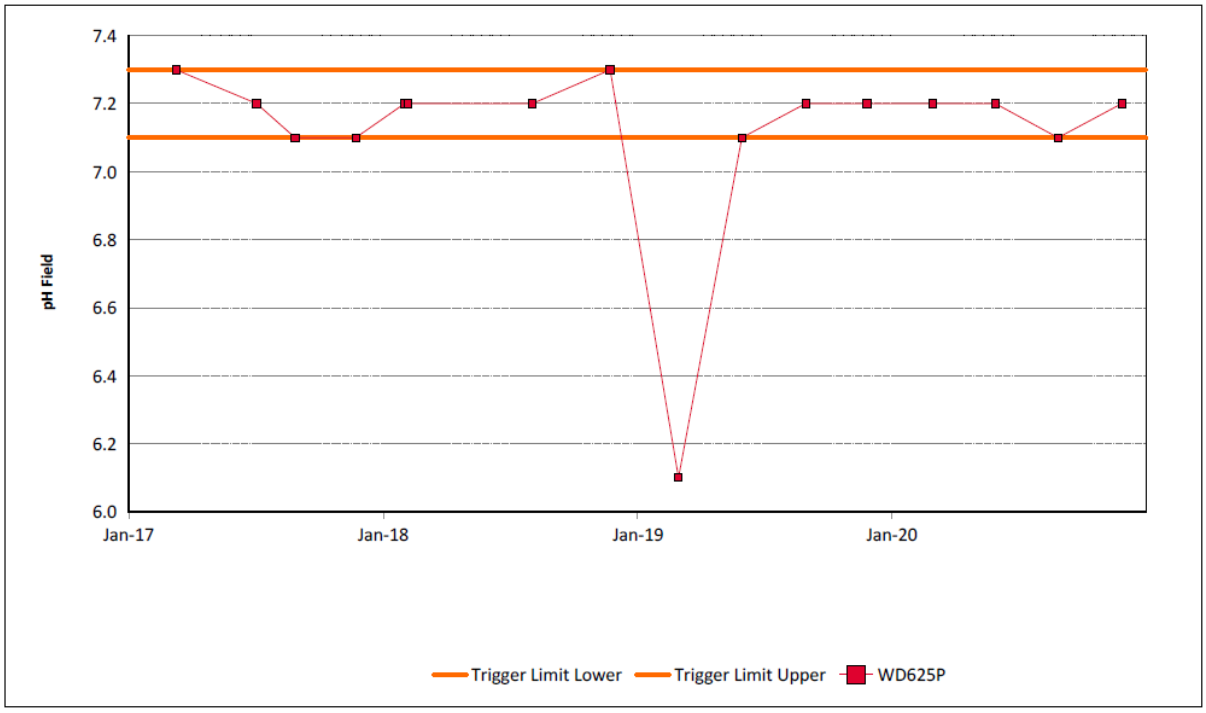


FIGURE 73: WOODLANDS HILL SEAM GROUNDWATER PH TRENDS 2017 TO 2020

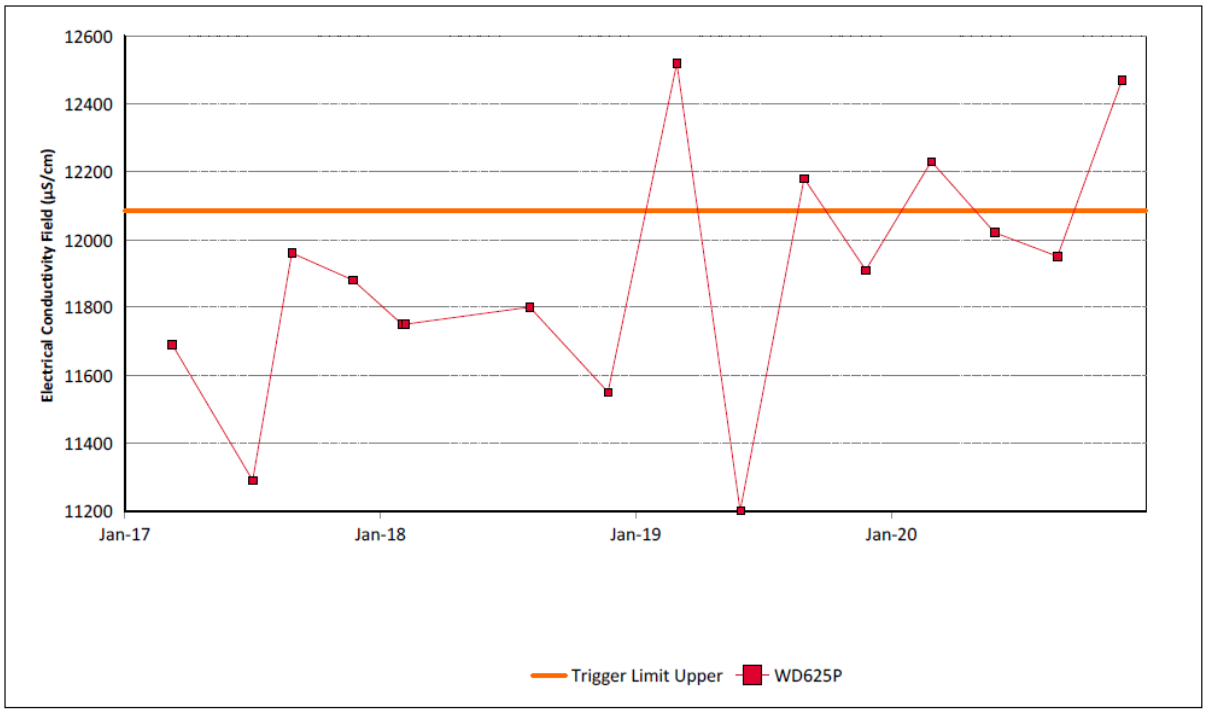


FIGURE 74: WOODLANDS HILL SEAM GROUNDWATER EC TRENDS 2017 TO 2020

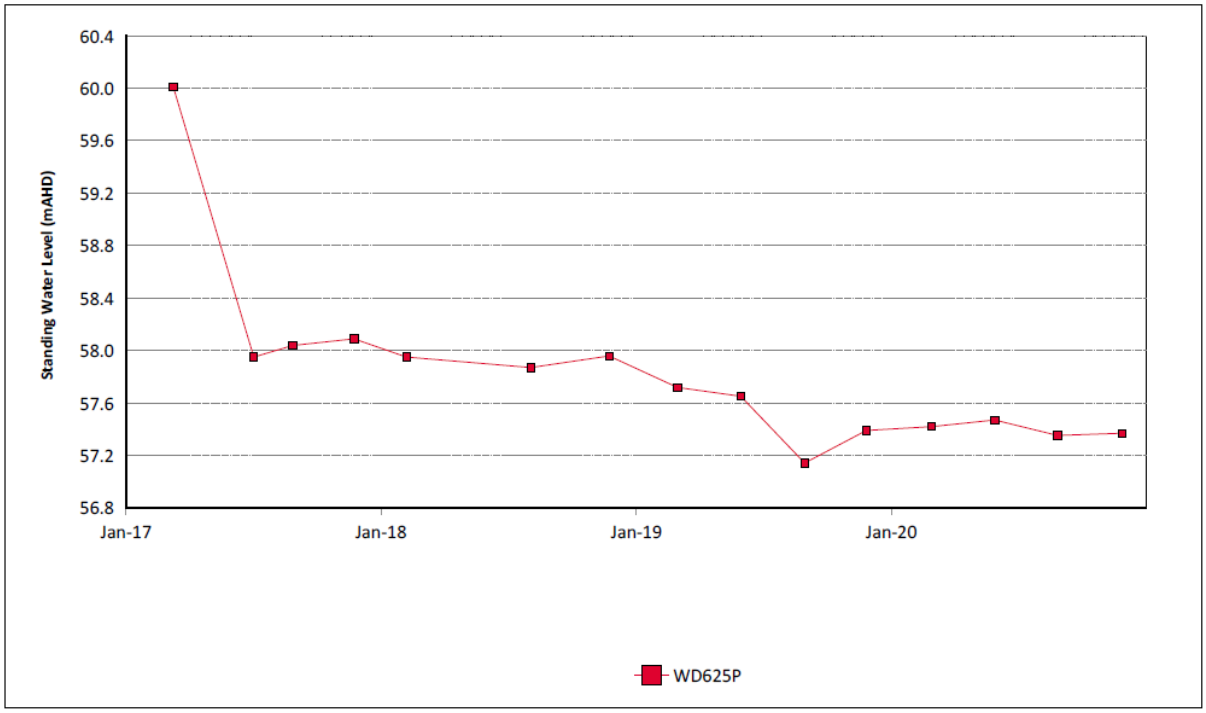


FIGURE 75: WOODLANDS HILL SEAM GROUNDWATER SWL TRENDS 2017 TO 2020

6.7.6.12 Aeolian Warkworth Sands

Groundwater monitoring in the Aeolian Warkworth Sands was undertaken from one site during 2020; a total of four samples were collected. The pH, EC and SWL trends for 2017 to 2020 are shown in **Figure 76**, **Figure 77** and **Figure 78** respectively. Historical water level data for the bore shows a general decline in groundwater levels within the Warkworth Sands. During 2020 groundwater levels within the Warkworth Sands at PZ7S started to recover, likely in response to above average rainfall received in February and March 2020. Further investigation into the local ground conditions, condition of the nested bore and functionality of the bore loggers will be undertaken during the 2021 reporting period, to understand the interaction between the two bore depths.

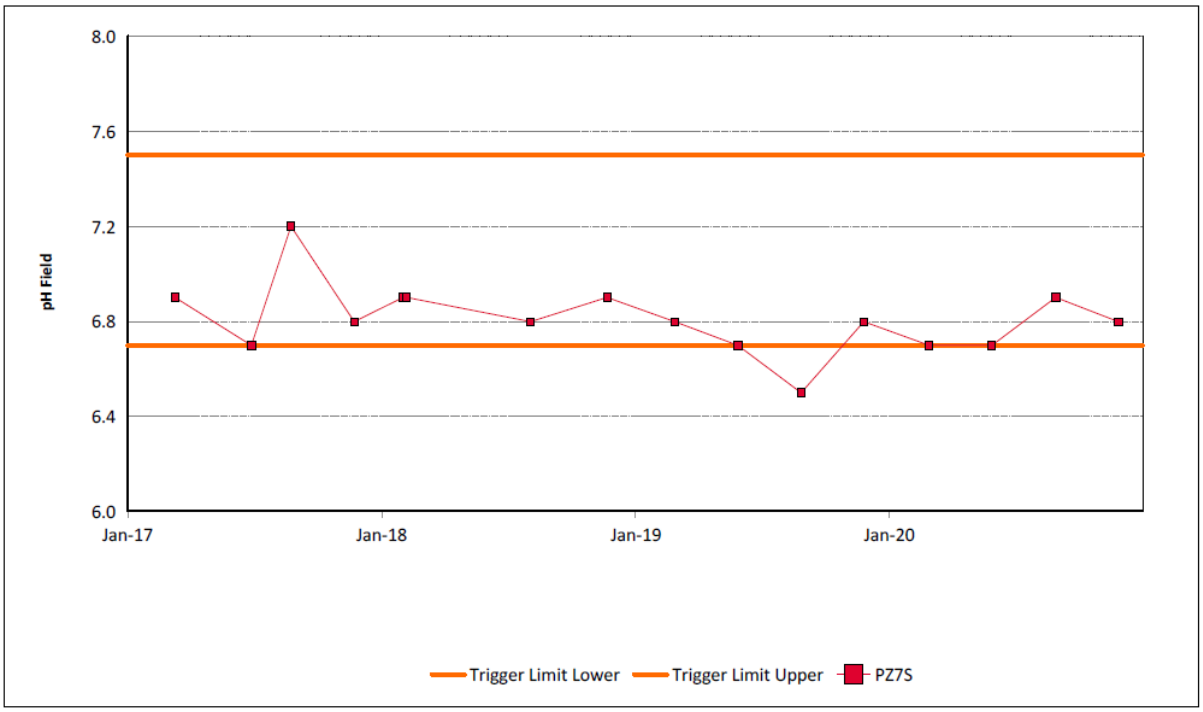


FIGURE 76: AEOLIAN WARKWORTH SANDS GROUNDWATER PH TRENDS 2017 TO 2020

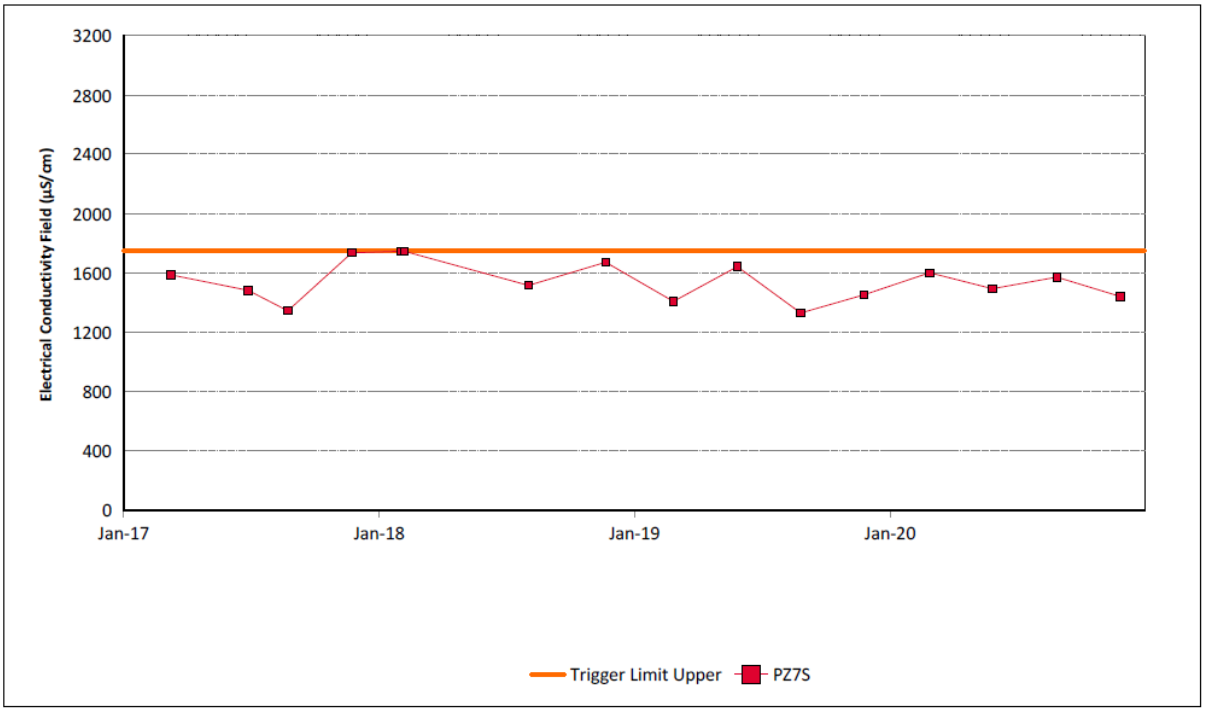


FIGURE 77: AEOLIAN WARKWORTH SANDS GROUNDWATER EC TRENDS 2017 TO 2020

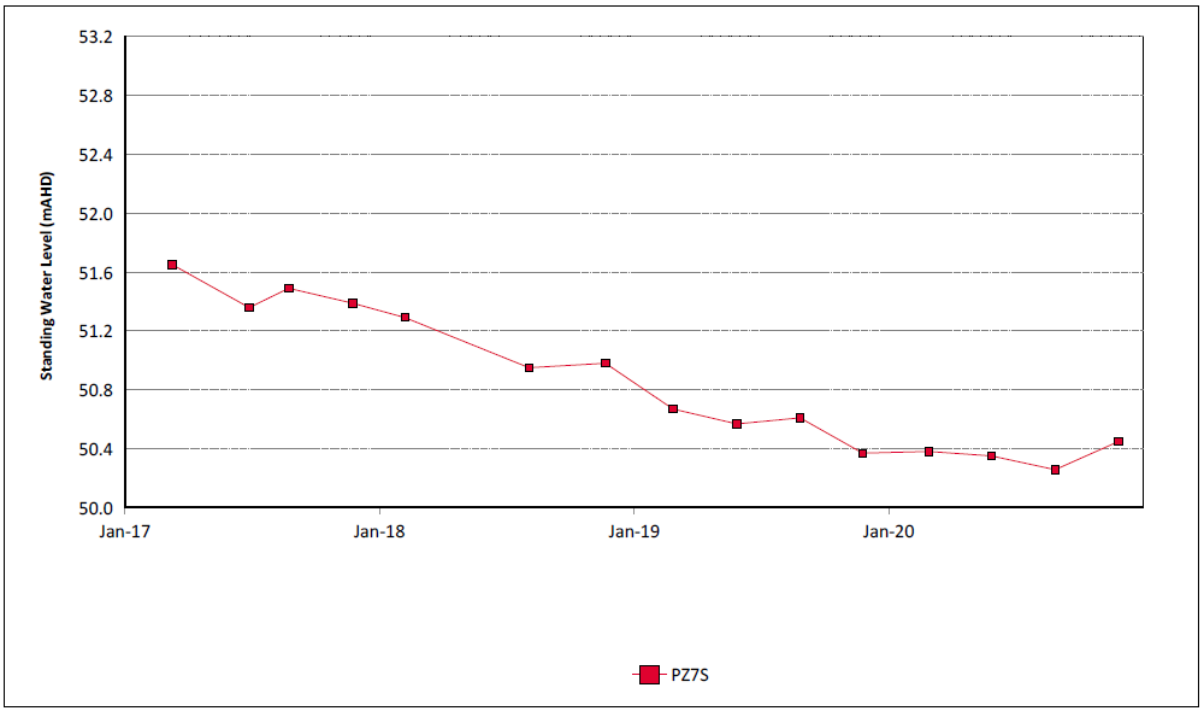


FIGURE 78: AEOLIAN WARKWORTH SANDS GROUNDWATER SWL TRENDS 2017 TO 2020

6.7.7 Audits and Reviews

Groundwater monitoring results are reviewed against the approved 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 **Figure 33** to **Figure 78.** 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 **Table 6.18** to **Table 6.28.**

An annual groundwater review was undertaken by an independent groundwater consultant. The scope of the review included an assessment of the water quality and groundwater levels recorded during the 2020 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 4.**

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

- Groundwater monitoring data indicates that, where saturated, water within the alluvium has started trending upwards in line with climate and stream flow trends. Groundwater within the Permian coal measures were mostly declining after exhibiting temporary head increases following above average rainfall events. Where observed, the decreasing elevations are believed to be attributed to depressurisation of the coal seams in relation to mining activities. The groundwater drawdown appears in line with the predicted drawdown with the coal measures around active mine areas.
- The review of the sites groundwater model predictions against the historical site data generally showed that the model appeared to adequately replicate observed changes in groundwater levels during the 2020 reporting period. The review did however highlight some areas for improvement to further validate the current groundwater model, these items are included in the groundwater report in **Appendix 4**.
- Review of water quality results and comparison to trigger levels for EC and pH identified several trigger exceedances over 2020. It was identified that several bores exceeded triggers for EC and pH; however, 2020 readings were mostly in line with historical trends for these bores. It is also noted that MTW changed its sampling methodology during the 2019 reporting period following recommendations in the 2018 review. It is recommended that a review of the trigger limits be undertaken in light of the revised sampling methodology. Groundwater quality trends outside of historical trends were observed for bore OH1138 and WOH2139A, which likely relate to declining groundwater levels. The decline in levels most likely relate to potential movement of groundwater and mixing of different water qualities given the larger hydraulic gradients in the aquifer caused by depressurisation and the groundwater system moving towards a new equilibrium (physically and chemically).
- Over 2020 monitoring of the groundwater bore network was generally conducted in accordance with the Groundwater Monitoring Program outlined within the WMP. Annual

samples were collected in general accordance with relevant standards. The exception to this was generally for cases where the condition of the bores (i.e. 32 mm casing) inhibited the ability to collect representative samples. Grab samples have been taken for monitoring bores WOH1239A, WOH2141A, WOH2153A, WOH1254A, WOH2155A, WOH2156A, WD622P, MBW02 and MBW03 within the network. This approach is not in line with industry standards and may not provide a representative water quality sample. The justification for this methodology should be reviewed to determine if more suitable methods (i.e. full purge or low flow) can be applied. In addition, a review into the requirement of these bores for the collection of water quality data for the WMP should be undertaken. If it is found that the continued collection of water quality data is required from a bore and suitable sampling methods cannot be adopted to obtain a representative sample, then bore rectification works should be considered.

- Quantification of groundwater take was undertaken based on reported volumes estimated for approved operations by AGE (2015) and metered abstraction volumes from bores and surface water pumps. Based on this information, over the 2020 reporting year the total take under the Hunter Regulated water source was estimated at 1,458.7 ML. Total take from Hunter Unregulated water source was estimated at 11 ML and 210 ML from the North Coast Fractured and Porous Rock water source.
- Comparison of observed groundwater levels against predicted levels generated from the numerical groundwater model were made. Overall, the numerical model was found to have adequately replicated observed changes in groundwater levels for 2020. Where modelled and observed values were significantly different, it was largely found that the difference in values could be attributed to differences in actual and predicted site conditions (i.e. climatic conditions, changes to mine progression / activities etc). A number of recommendations therefore related to updating the model including a review of VWP data and construction, better matching of actual mine progression, inclusion of the LUG bore abstraction and current climate and streamflow trends.
- Overall, the current monitoring network and program is generally adequate for satisfying current monitoring requirements of the WMP. There is good spatial of coverage of monitoring locations across the site, with multiple bores and VWP sensors installed into each relevant aquifer unit.

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

- Review the groundwater monitoring network and program to more clearly identify the purpose of each bore based on its location and construction, and align the compliance conditions to this purpose. Including inclusion of newly installed monitoring points and removal or replacement of bores/sensors from the program that have been identified as destroyed/erroneous.
- Check surveyed ground and casing elevations for bores including MBW6A and OH1125 (2).
- Check standpipe stickup measurements for MTD605P, MTD614P and MTD616P.

- Check VWPs and monitoring bore loggers are working correctly (i.e. check/replace batteries and logger depths) and adjust the site barometric logger to log on the hour (i.e. 9am, 10am, 11am etc.).

Recommended VWP sensor investigations and replacements/ removal include:

- WD645 S1 (replace/ remove) and S5 (investigate first);
- WD646R S2 (replace/ remove) and S5 (investigate first);
- MTD605 S2 (investigate first) and S6 (replace/ remove); and
- MTD616 P1 (investigate first – particularly noting the correct naming convention and sensor depth as there have been a range of names for this array of VWPs relating to different depths, e.g. P1, sensor 1, S1, VW1 etc.).
- Investigate ground conditions, bore construction and logger data for nested bore PZ7S and PZ7D.
- Installation of data logger within bore OH786 and replacement of logger for PZ7S.
- Review of logger installation depths for MB15MTW02S as the currently verified depth is not providing accurate water levels compared to manual dipped measurements. The standpipe stickup should also be checked for MB15MTW02S.
- Investigate the condition of the logger in MB15MTW03 and replace logger if it is found to be faulty.
- The monitoring methodology and bore logs should be assessed to devise a suitable method for attaining water quality samples. This is important as the last full water quality suite analysis undertaken for OH786 was in June 2016.
- Review the bore condition and construction records to verify the total bore depth for OH787.
- Review the bore logs for MB15MTW01S and MB15MTW02S to determine whether target geology is alluvium or weathered Permian coal measures.
- Review bore logs for OH1121 to determine if the bore has been installed in the Vaux Seam which according to geology map should not be present at this location.
- Further investigation into site conditions around MTD616P should be undertaken to confirm that no land use changes or activities have caused rising groundwater level trends in this bore.
- Review of groundwater quality triggers to ensure they are reasonable and adequately capture historical trends for bores and account for changing climate conditions.
- Continue to update the numerical groundwater model to account for climate trends and actual mine progression activities that have evolved since the initial model development.

6.8 Waste

6.8.1 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 Environmental 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 Environmental Protection Agency (EPA).

6.8.2 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 2020 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 2020, in relation to waste management during the reporting period.

7 REHABILITATION

7.1 Summary of Rehabilitation

A total of 38.5 ha of new rehabilitation was undertaken during 2020 against a Mining Operations Plan (MOP) target of 43.8 ha. A further 45.6ha of Stage 2 rehabilitation was seeded to the target vegetation community seed mixes in 2020 to reduce the legacy rehabilitation areas that are in the Growth Medium Development phase.

Total disturbance undertaken during 2020 was 50.6 ha, which was slightly lower than the MOP projection of 51.8 ha. The disturbance during 2020 was made up of 46.7 ha of new disturbance and 3.9 ha of disturbance of previously rehabilitated area.

TABLE 7.1 KEY REHABILITATION PERFORMANCE INDICATORS

Mine Area Type	Previous Reporting Period (Actual) Year 2019 (ha)	This Reporting Period (Actual) Year 2020 (ha)	Next Reporting Period (Forecast) Year 2021 (ha)
A. Total mine footprint[1]	3,881.2	3,934.1	3,952.3
B. Total Active Disturbance[2]	2,579.8	2,601.3	2,580.2
C. Land being prepared for rehabilitation[3]	159.1	104.9	20.0
D. Land under active rehabilitation[4]	1,142.3	1,227.9	1,352.1
E. Completed rehabilitation[5]	0	0	0

[1] ***Total mine footprint*** *includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities. As such it is the sum of total active disturbance, decommissioning, landform establishment, growth medium development, ecosystem establishment, ecosystem development and relinquished lands (as defined in DRE MOP/RMP Guidelines). Please note that subsidence remediation areas are excluded.*

[2] ***Total active disturbance*** *includes all areas ultimately requiring rehabilitation such as: on-lease exploration areas, stripped areas ahead of mining, infrastructure areas, water management infrastructure, sewage treatment facilities, topsoil stockpiles areas, access tracks and haul road, active mining areas, waste emplacements (active/unshaped/in or out-of-pit), and tailings dams (active/unshaped/uncapped).*

[3] ***Land being prepared for rehabilitation*** *– includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE MOP/RMP Guidelines).*

[4] ***Land under active rehabilitation*** *– includes areas under rehabilitation and being managed to achieve relinquishment – includes the following rehabilitation phases as described in the DRE MOP/RMP Guidelines – "ecosystem and land use establishment" and "ecosystem and land use sustainability" (revegetation assessed as showing signs of trending towards relinquishment OR infrastructure development).*

[5] ***Completed rehabilitation*** *– requires formal sign off by DRE that the area has successfully met the rehabilitation land use objectives and completion criteria.*

7.1.1 Management of Rehabilitation

Performance criteria for each rehabilitation phase is provided in detail in the MOP for MTW. The criteria have been developed so that the rehabilitation success can be quantitatively tracked as it progresses through the phases outlined below:

- Stage 1 – Decommissioning
- Stage 2 – Landform Establishment
- Stage 3 – Growth Medium Development
- Stage 4 – Ecosystem and Land use Establishment
- Stage 5 – Ecosystem and Land use Sustainability
- Stage 6 – Rehabilitation Complete

The performance criteria are objective target levels or values that can be measured to quantitatively demonstrate the progress and ultimate success of a biophysical process. A monitoring methodology has been developed to measure the performance criteria outlined in the MOPs utilising a combination of tools that provide quantitative data to assess changes occurring over time.

The target levels or values have been based on monitoring results from reference sites and were detailed in the MOP Amendment A approved by Resources Regulator in December 2018. The results of the rehabilitation monitoring programme for native vegetation areas are compared against the target levels to determine if rehabilitation has been successful or if additional intervention is needed.

Monitoring of rehabilitated land returned to native vegetation commenced in 2015. The results of this monitoring and monitoring programs conducted in 2017 and 2019 have been presented in previous MTW Annual Environmental Reviews (AER's). Monitoring has been conducted across 12 reference sites within the two target vegetation communities Central Hunter Grey Box-Ironbark Woodland EEC, and Ironbark-Spotted Gum-Grey Box Forest EEC. Previous monitoring programs have established 50 permanent monitoring transects across MTW rehabilitation areas with the majority of these sites having been revisited in successive years to provide information on the progression of sites over time. Sites have been selected to include rehabilitation of varying ages and different rehabilitation methods.

No monitoring of rehabilitated land was undertaken in 2020 due to the MOP performance criteria being changed in response to recommendations from the Independent Review of Rehabilitation Progress prepared at the end of 2019. The MOP performance criteria have been accepted following approval of the MTW MOP Amendment C in November 2020 so the monitoring program will be amended to reflect the new performance criteria and monitoring will restart in Autumn 2021.

The key issues affecting successful rehabilitation at MTW and the control measures implemented to address these issues are listed below:

Issue 1 – Weed competition affecting native vegetation establishment.

Control Measures.

Use of mine spoil as growth medium to avoid use of weedy topsoils in rehabilitation. This technique has proven successful in establishing diverse native vegetation when combined with the use of composts and other ameliorants to improve the physical, chemical and nutritional quality of the mine spoil. Suitable alternative compost products have been sourced and used in 2019 and 2020 in place of the Mixed Waste Compost, which was banned from use by the EPA in 2018.

Weed control on topsoil stockpiles.

Topsoil stockpiles established prior to 2011 were seeded with exotic pasture species to provide a suitable cover for erosion protection. These competitive exotic species are causing weed problems in rehabilitation areas when the soil from these stockpiles is used on areas being returned to native vegetation. MTW has a topsoil stockpile maintenance program in place to spray out the exotic pasture species and sow native species on these old stockpiles. Stockpiles may require a number of weed control passes to adequately reduce weed levels before sowing to native species. New topsoil stockpiles are being treated in much the same way as new rehabilitation areas, in terms of weed control and soil amelioration, before being sown to native species. Establishment of native species on topsoil stockpiles will reduce the presence of weeds and provide a soil seed bank in rehabilitation areas that contains seeds from desirable native species.

Pre- and post-sowing weed control in rehabilitation.

MTW has implemented an extensive weed control program in rehabilitation areas to reduce the amount of weeds and assist the establishment of native vegetation. This program involves the use of boom sprays for both pre-sowing and pre-emergent spray passes to control weeds volunteering from the topsoil. After the native species have germinated, a weed-wiper can be used to control weeds that are taller than the native species. Herbicide can be wiped onto the taller weeds without affecting the emerging native species. Crews using backpack sprays and Quikspray units are also used to selectively control weeds that are growing amongst desirable native species.

Issue 2 – Topsoil/spoils prone to dispersion leading to surface crusting, erosion and poor vegetation establishment.

Control Measures.
Addition of ameliorants to topsoil/spoil. MTW conducts soil testing on the topsoil/spoil material that is used in rehabilitation areas. Based on the results of the soil testing, ameliorants such as compost, gypsum, lime and fertilisers are then used to address the physical, chemical and nutritional deficiencies of the topsoil/spoil. Subsequent applications of ameliorants are undertaken as required to address poor performing rehabilitation areas with continuing soil quality issues.

Issue 3 – Lack of native seed in topsoil seed bank leading to poor vegetation establishment.

Control Measures.
Sourcing of diverse native seed mixes. MTW has generally found that the soil seed bank in topsoils from both stripping areas and topsoil stockpiles cannot be relied on to contain sufficient native seed propagules for successful native vegetation establishment in rehabilitation. MTW has established medium term contracts with seed suppliers to provide some security of supply to suppliers who are then able to collect and store sufficient quantities of seed to meet MTW's future demands. The seed supply contracts include quality assurance controls to ensure the seed being purchased is of suitable quality i.e. satisfactory provenance, correct species, high seed count and viability.

7.2 Decommissioning

Capping of the Interim Tailings Storage Facility continued during 2020 using breaker rock from the South CHPP. A capping of inert spoil will be placed over the breaker rock before rehabilitating the area.

During 2017, capping of Tailings Dam 2 commenced using small contractor-owned equipment to place selected mine spoil in layers across the tailings dam surface. Capping work was suspended during 2017 due to settlement cracking occurring in an area where the tailings surface had low strength. Stage 1 capping work was recommenced during 2020 in areas where geotechnical studies identified that the tailings strength was sufficient to support the capping process. During the reporting period mine equipment has been able to continue capping on some areas where the Stage 1 capping had been finished. The other focus of activity during 2020 has been on pumping activities to keep the surface of the tailings storage facility dry. The aim of this work is to increase the strength of the top layer of the tailings to allow the Stage 1 capping work to continue.

7.3 Rehabilitation Performance

Table 7.2 summarises actual rehabilitation and disturbance completed compared with the rehabilitation commitments in the MTW MOP. **Appendix 5** provides the Annual Rehabilitation Report Form, including rehabilitation progress for each domain through the rehabilitation phases.

The area of new and Stage 2 rehabilitation that was sown during the reporting period was 40.3ha above the MOP target for MTW. The area of rehabilitation disturbance was slightly higher than the MOP target for MTW by 0.9ha, leading to a net rehabilitation result for 2020 that was 39.4ha above the MOP commitment. The net rehabilitation result over the MOP period (2015 to 2020) is 345.1ha versus a MOP commitment of 388.4ha, lagging by 43.3ha. This shortfall will be caught up in 2021 with the Stage 2 seeding that is planned during this period.

The amount of new disturbance undertaken in 2020 was 2.1ha lower than the MOP projections. The cumulative new disturbance over the period of the current MOP is also 2.0ha lower than the projected disturbance.

The 2020 rehabilitation areas for MTW are shown in **Appendix 6.**

TABLE 7.2 REHABILITATION AND DISTURBANCE COMPLETED IN 2020

MOP	Pit Area	2020 Totals (ha)		Cumulative Totals During MOP Period* (ha)	
		Actual	MOP Commitment	Actual	MOP Commitment
Rehabilitation					
MTW	Mt Thorley	35.9[1]	19.8	151.1	174.6
	Warkworth	48.2[2]	24.0	319.5	338.5
	MTW Total	**84.1**	**43.8**	**470.6**	**513.1**
Rehabilitation Disturbance					
MTW	Mt Thorley	0.1	0.0	52.9	52.8
	Warkworth	3.8	3.0	72.6	71.9
	MTW Total	**3.9**	**3.0**	**125.5**	**124.7**
New Disturbance					
MTW	Mt Thorley	8.5	7.3	35.5	67.3
	Warkworth	38.2	41.5	389.1	359.3
	MTW Total	**46.7**	**48.8**	**424.6**	**426.6**
Net Rehabilitation (Rehabilitation minus Rehabilitation Disturbance)					
MTW	Mt Thorley	35.8	19.8	98.2	121.8
	Warkworth	44.4	21.0	246.9	266.6
	MTW Total	**80.2**	**40.8**	**345.1**	**388.4**

Note: Rehabilitation areas relate to areas at or past the phase of Ecosystem and Landuse Establishment.

** MOP Period is 2015 – 2021*

[1] Includes 19.2ha of Stage 2 Seeding

[2] Includes 26.4ha of Stage 2 Seeding

Progressive rehabilitation commitments are outlined in the Warkworth Continuation 2014 and Mt Thorley Operations 2014 Environmental Impact Statements. These documents modelled a total of 1,103 ha of rehabilitation to be completed by the end of 2017, and a further 505.8ha to be completed by the end of 2023. At the end of the reporting period there had been 1,227.9 hectares of rehabilitation completed across MTW, 124.9ha ahead of the EIS forecast for the end of 2017. By the end of 2021 it is predicted there will be 1,352.1ha of rehabilitation completed which will be 256.7ha short of the EIS forecast for the end of 2023. It is considered unlikely that there will be 257ha of rehabilitation available to be completed in the period 2022 to 2023 so the completed rehabilitation at the end of 2023 is expected to be 5 to 10% (80 to 160ha) less than the EIS forecast.

7.4 Rehabilitation Programme Variations

A MOP amendment (Amendment C) was submitted during the reporting period which included the following changes:

- updated Map 3A to 3G to reflect the findings of the Independent Review of Rehabilitation Progress: Mount Thorley-Warkworth Mine in relation to rehabilitation phase classification;
- recommendations from the Independent Review of Rehabilitation Progress: Mount Thorley Warkworth Mine related to performance criteria and seed mix changes;
- revised final landform for filling of the South Pit Void;
- earlier commencement of tailings deposition into the Loders Pit Tailings Storage Facility (TSF) in lieu of raising the embankment height on the Centre Ramp TSF;
- reduced estimates for new rehabilitation to be completed in the period from 2020 to 2021;
- revised Rehabilitation Cost Estimates for Mount Thorley and Warkworth.

7.5 Rehabilitation Trials

During 2018, a trial was undertaken on the CD Dump rehabilitation area of MTW to mainly compare the performance of an inoculated mineral fertiliser against that of Mixed Waste Compost as a soil ameliorant. The trial was conducted on plots that used both topsoil and mine spoil as the growth medium with the various treatments shown in the table below.

Monitoring of this trial will be undertaken during 2021 to determine the relative effects of the various soil ameliorants.

TABLE 7.3 SOIL AMELIORATION TREATMENTS USED FOR 2018 CD DUMP REHABILITATION TRIAL

Plot	Area ha	Growth Medium	Gypsum t/ha	Compost t/ha	Lime kg/ha	Fertiliser kg/ha
A1	0.95	Topsoil	0	50	300	300
A2	0.36	Topsoil	0	50	300	0
A3	0.28	Topsoil	0	50	0	400
A4	0.2	Spoil	0	50	300	0
A5	0.14	Spoil	0	50	300	300
B1	0.46	Topsoil	0	0	0	400
B2	0.29	Topsoil	0	0	300	300
B3	0.23	Topsoil	0	0	300	0
B4	0.2	Spoil	0	0	300	300
B5	0.2	Spoil	0	0	0	400
B6	0.18	Spoil	0	0	300	0
C1	4.31	Topsoil	10	100	0	0
C2	1.01	Spoil	10	100	0	0
Trial Total	**8.81**					

Bettergrow Biomulch Compost was trialled as a replacement for Mixed Waste Compost as a soil ameliorant in rehabilitation during 2019 and 2020. Compost application rates for the Bettergrow Biomulch Compost were reduced to approximately 50t/ha (from 100t/ha used for the Mixed Waste Compost) to offset the increased cost of this compost. Germination and early establishment appears to be adequate even with the reduced application rates.

Trials were also conducted in 2020 to investigate the effect of not adding compost to topsoils. These trials are of particular interest for rehabilitation where topsoil has been used that has a high weed seed load. It is thought that not adding compost to "weedy" topsoils could reduce the growth of competitive weed species and hence result in better establishment of native species. Rehabilitation areas within the trials have received identical treatments apart from the addition of compost to some areas to allow for a comparison of results on composted versus un-composted areas.

7.6 Rehabilitation Maintenance

Management of rehabilitated areas is undertaken as required or when issues are identified through monitoring, auditing or inspections. Rehabilitation maintenance activities are described further in the sections below.

Post rehabilitation broadacre weed control

Broadacre weed treatment within rehabilitation areas is undertaken using agricultural methods comprising boom sprays and wick wipers. In existing rehabilitation areas boom spraying is primarily used to manage cover crop and fallow areas prior to sowing to final native seed mixes. Pre-emergent application of herbicide is occasionally necessary to control emerging weeds in the period between

sowing and germination of the desired plants. Wick wiping targets rapidly growing exotic grasses and other erect growing weeds in the period following native germination but while desirable species remain below the wiper target zone. During 2020 areas totalling 66.1ha of existing rehabilitation received boom spray and/or wick wiper treatment.

Hand spraying and manual removal of weeds is also undertaken in rehabilitation areas with establishing native vegetation. During 2020 areas totalling 215.5ha were treated using selective weed control methods (i.e. backpack spray, Quikspray, cut and paint, manual removal). The area of selective weed control has increased significantly again in 2020 (up from 37ha in 2018 and 171.5ha in 2019) in response to the changing rehabilitation methodology to move more quickly to sowing rehabilitation areas with the diverse native seed mixes.

Rehabilitation areas receiving weed control during 2020 are shown in **Figure 79** below. Note some areas may have received a combination of treatments during the reporting period.

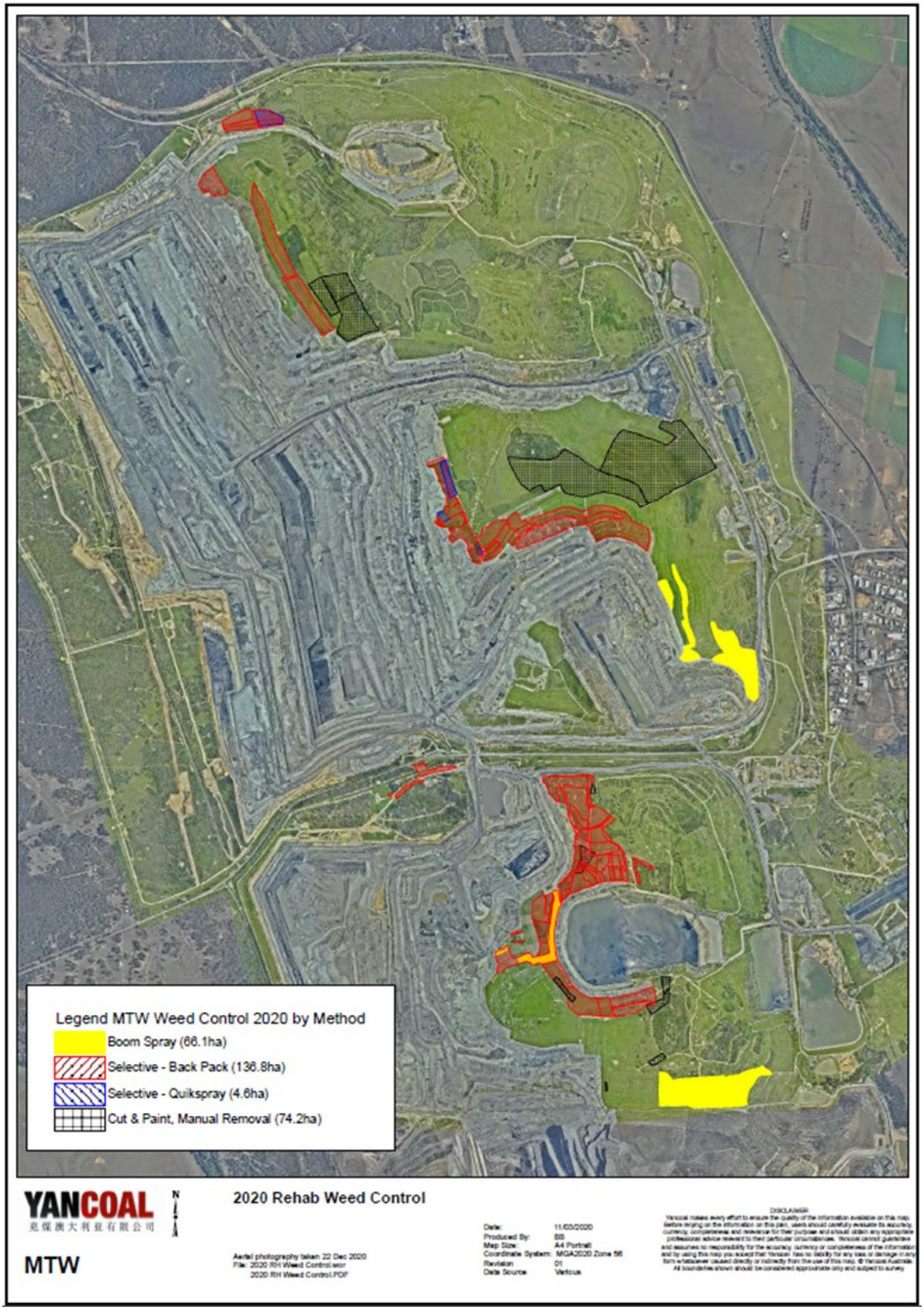


FIGURE 79: 2020 REHABILITATION WEED CONTROL LOCATIONS

7.7 Topsoil Management

Topsoil is managed according to MTW's Disturbance and Rehabilitation procedures. **Table 7.4** outlines the topsoil used and stockpiled during 2020. There was 28.6 ha of rehabilitation top soiled during 2020, using stockpiled and pre-stripped soil resources.

TABLE 7.4 SOIL MANAGEMENT

Soil Used this Period (m^3)	Soil Prestripped this Period (m^3)	Stockpile Inventory to Date (m^3)	Stockpile Inventory Last Report (m^3)
28,600	35,200	666,929	660,357

7.8 Tailings Management

Detail of capping activities on tailings storage facilities at MTW is covered in **Appendix 5**. Minimising the amount of standing water on tailings storage facilities, by managing the decant water, is important during and post tailings deposition to assist with closure of these facilities. Effective removal of decant water enables better consolidation of the tailings material, which in turn facilitates earlier capping and rehabilitation of the storage facility. **Table 7.5** outlines the current state of decant water pumping infrastructure across the active and inactive TSF's at MTW.

TABLE 7.5 TAILINGS MANAGEMENT

Facility	Status	Decant System
Centre Ramp TSF	Active	Decant pumps in place, regular pumping
Abbey Green South	Active	Decant pumps installed as required due to infrequent filling regime.
TD2	Inactive (Capping in progress)	Diesel Pump in place
Interim TSF	Inactive (Capping in progress)	Floating solar pump installed
Ministrip TSF	Active	Diesel Pump in place, pumping as required
Loders Pit TSF	Active	Tailings deposition commenced in January 2021, decant pumps in place, regular pumping

7.9 Weed Control

7.9.1 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. A total of 96 days of weed management work was undertaken on site at MTW during 2020, with 393 ha of land treated, including maintenance of access tracks and 56 environmental monitoring points. The weeds targeted during the 2020 weed management programme were based on the results of the 2019 weed survey. **Figure 80** 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)*
- Castor oil *(Ricinus communis)*
- Farmers friends *(Bidens pilosa)*
- Galenia *(Galenia pubescens)*
- Green cestrum *(Cestrum parqui)*
- Lantana *(Lantana Camara)*
- Mother of millions *(Bryophyllum delagoense)*
- Narrow leaf cotton bush *(Gomphocarpus fructicosus)*
- Opuntia (Pear) species (Tiger, Prickly and Creeping Pear)
- Saligna *(Acacia saligna)*
- St Johns Wort *(Hypericum perforatum)*
- Various grasses (Various spp)

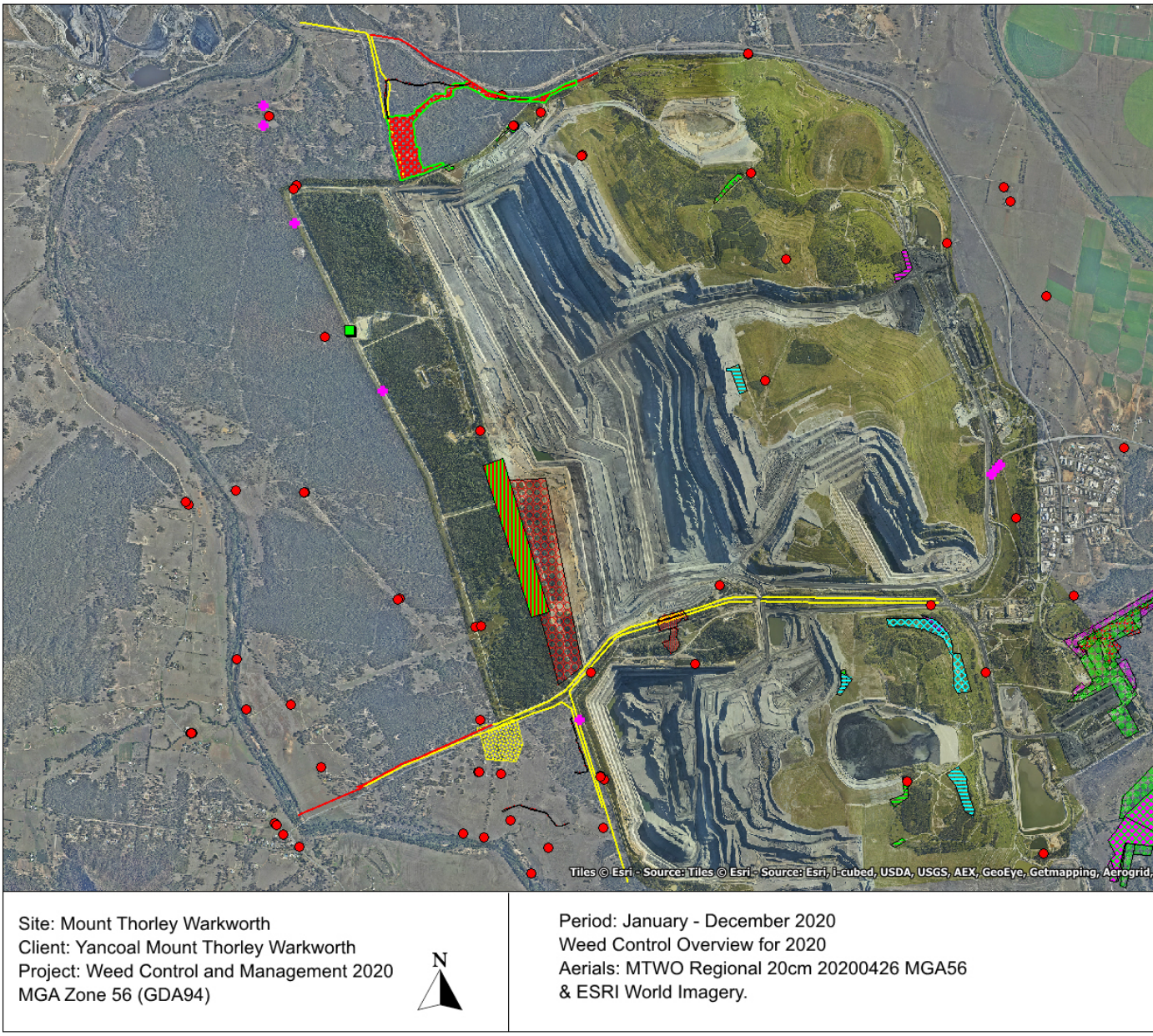


FIGURE 80: ANNUAL WEED CONTROL OVERVIEW FOR 2020

7.9.2 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 2020 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 which covers the area occupied by MTW.

Eight WONS were identified during the survey, they included:

- African boxthorn *(Lycium ferocissimum)* State – Asset protection
- Bitou bush *(Chrysanthemoides monilifera subspecies rotundata)* State – Containment
- Fireweed *(Scenecio madagascariensis)* State – Asset protection/ Regional – additional species of concern
- Lantana *(Lantana camara)* State – Asset protection

Pear Species:

- Creeping pear *(Opuntia humifusa)* State – Asset protection
- Prickly pear *(Opuntia stricta)* State – Asset protection/ Additional species of concern
- Tiger pear *(Optunia aurantiaca)* State – Asset protection
- Velvety pear tree *(Opuntia tomentosa)* State – Asset protection

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

- African olive *(Olea europea subspecies cuspidae)* Regional – Asset protection
- African lovegrass *(Eragrostis curvulva)* Regional – Additional species of concern
- Balloon vine *(Cardiospermum grandiflorum)* Regional – Additional species of concern
- Blue heliotrope *(Heliotropium amplexicaule)* Regional – Additional species of concern
- Castor oil plant *(Ricinus communis)* General biosecurity duty
- Coolatai grass *(Hyparrhenia hirta)* Regional - Asset protection
- Fleabane *(Conyza bonariensis)* General biosecurity duty
- Galenia *(Galenia pubescens)* Regional – Additional species of concern
- Green cestrum *(Cestrum parqui)* Regional - Asset protection
- Mother of millions *(Bryophyllum delagonese)* Regional - Asset protection
- Pampas grass *(Cortaderia selloana)* Regional - Containment
- Saffron thistle *(Cartharmus lanatus)* General biosecurity duty
- St Johns Wort *(Hypericum perforatum)* Regional – Additional species of concern
- Bathurst burr *(Xanthium spinosum)* General biosecurity duty
- Noogoora burr *(Xanthium occidentale)* Regional Additional species of concern

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

- Blackberry nightshade *(Solanum nigram)*
- Century plant *(Agave americana)*
- Golden wreath wattle or Saligna *(Acacia saligna)*
- Inkweed *(Phytolacca octandra)*
- Lambs tongue *(Verbascum Thapsus)*
- Mustard weed *(Sisymbrium sp)*
- Narrow leaved cotton bush *(Gomphocarpus fructicosus)*
- Paddy melon *(Cucumis myriocarpus)*
- Rhodes grass *(Chloris gayana Kunth)*
- Stinking Rodger *(Tangetes minuta)*
- Spiny Rush (Juncas acutus)
- Tree Tobacco (Nicotiana glauca)

Species identified during the 2020 survey will form the basis of ongoing weed management works during 2021.

7.10 Vertebrate Pest Management

As part of MTW's Vertebrate Pest Action Plan a baiting programme is carried out on a seasonal basis. Two 1080 ground baiting programmes consisting of approximately 60 bait sites utilising meat baits and ejector 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 7.6 summarises the results from the programmes carried out at MTW during 2020 with baiting locations and results for the programmes are illustrated in **Figure 81** and **82**.

TABLE 7.6 VERTEBRATE PEST CONTROL SUMMARY

Season	1080 Baiting			
	Total Lethal Baits Laid	Takes by Wild Dog	Takes by Fox	Takes by Feral Pigs
Autumn	120	27	9	1
Spring	120	60	6	-
Total	**240**	**87**	**15**	**1**

Additional pest management programmes included:

- Feral pig 1080 baiting programme carried out across MTW in winter resulted in 13 feral pigs poisoned. Rabbit 1080 baiting programme carried out at the same time resulted in 400g of poisoned carrots consumed.
- Opportunistic shooting of vertebrate pests; two hare and one deer.

MTW will continue to carry out quarterly vertebrate pest control programmes during 2021 to limit feral pest impacts on landholdings and surrounding neighbours.

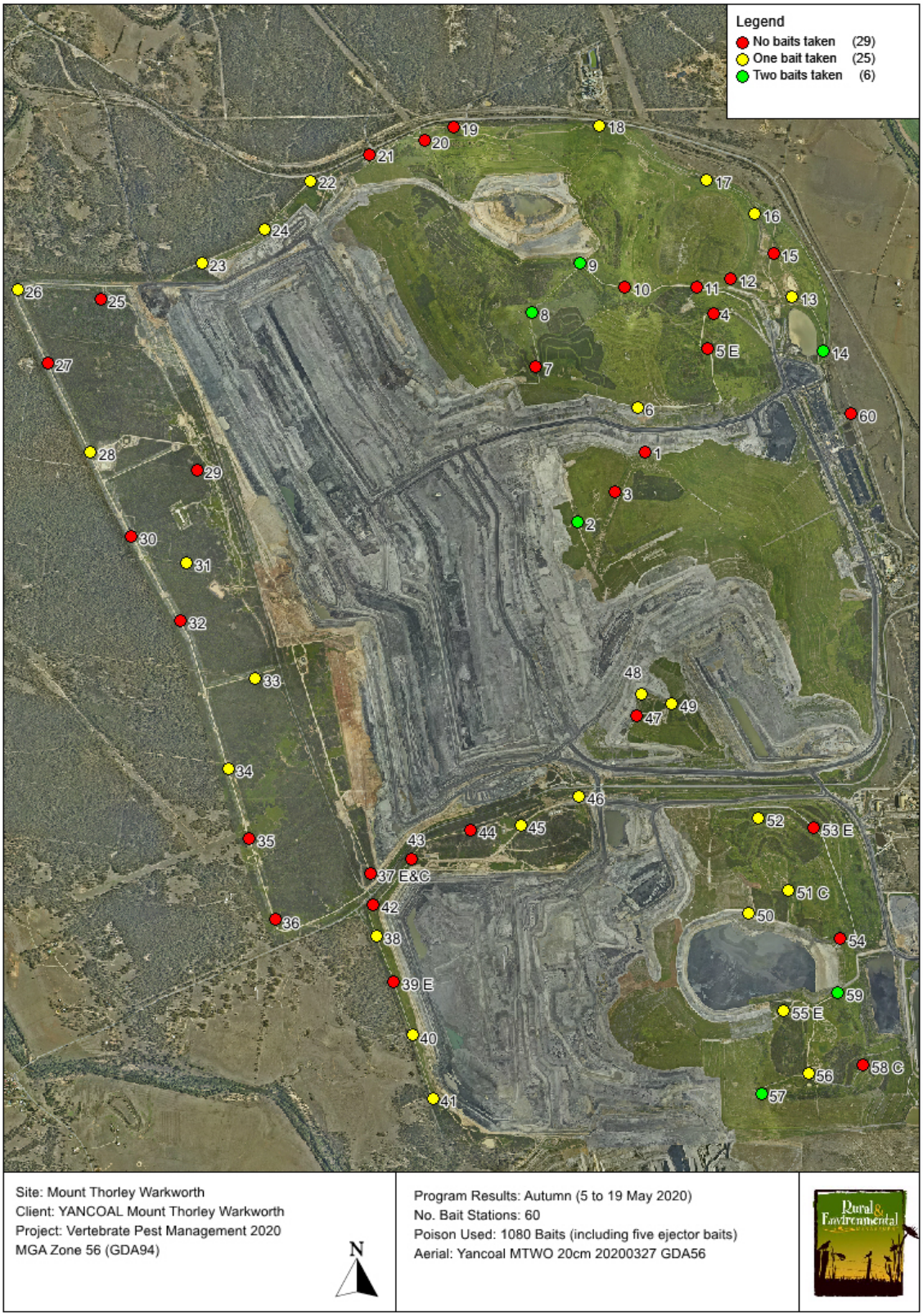


FIGURE 81: BAITING STATION LOCATIONS AND RESULTS AT MTW DURING AUTUMN 2020 VERTEBRATE PEST MANAGEMENT PROGRAMME

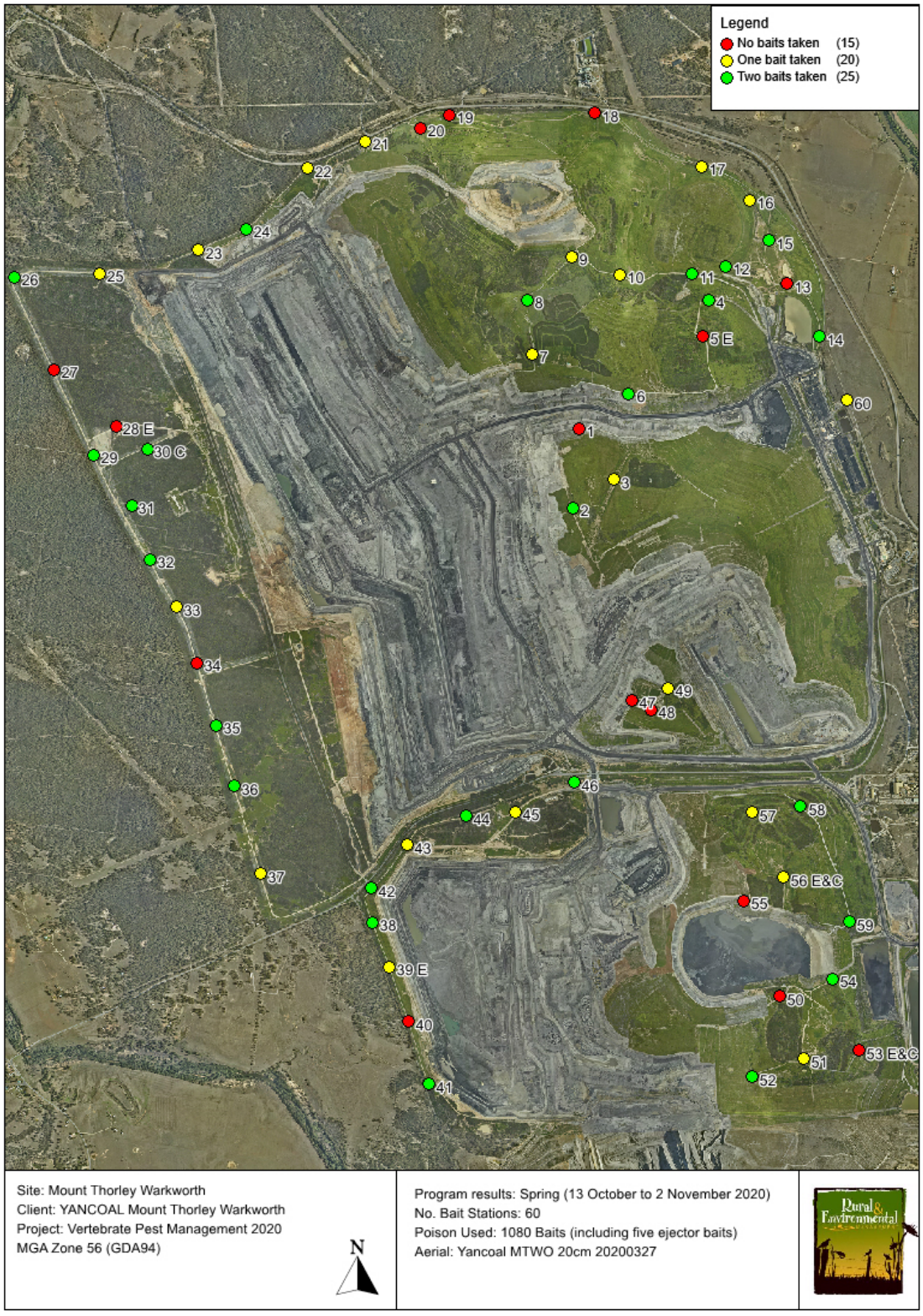


FIGURE 82: BAITING STATION LOCATIONS AND RESULTS AT MTW DURING SPRING 2020 VERTEBRATE PEST MANAGEMENT PROGRAMME

7.11 Biodiversity Offsets

7.11.1 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 83** and also listed in **Table 7.7** below:

TABLE 7.7 MTW BIODIVERSITY AREAS

Biodiversity Areas	Area (ha)	Environmental Approvals				Offset Feature/s
		State		Federal		
		NSW 2014	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.

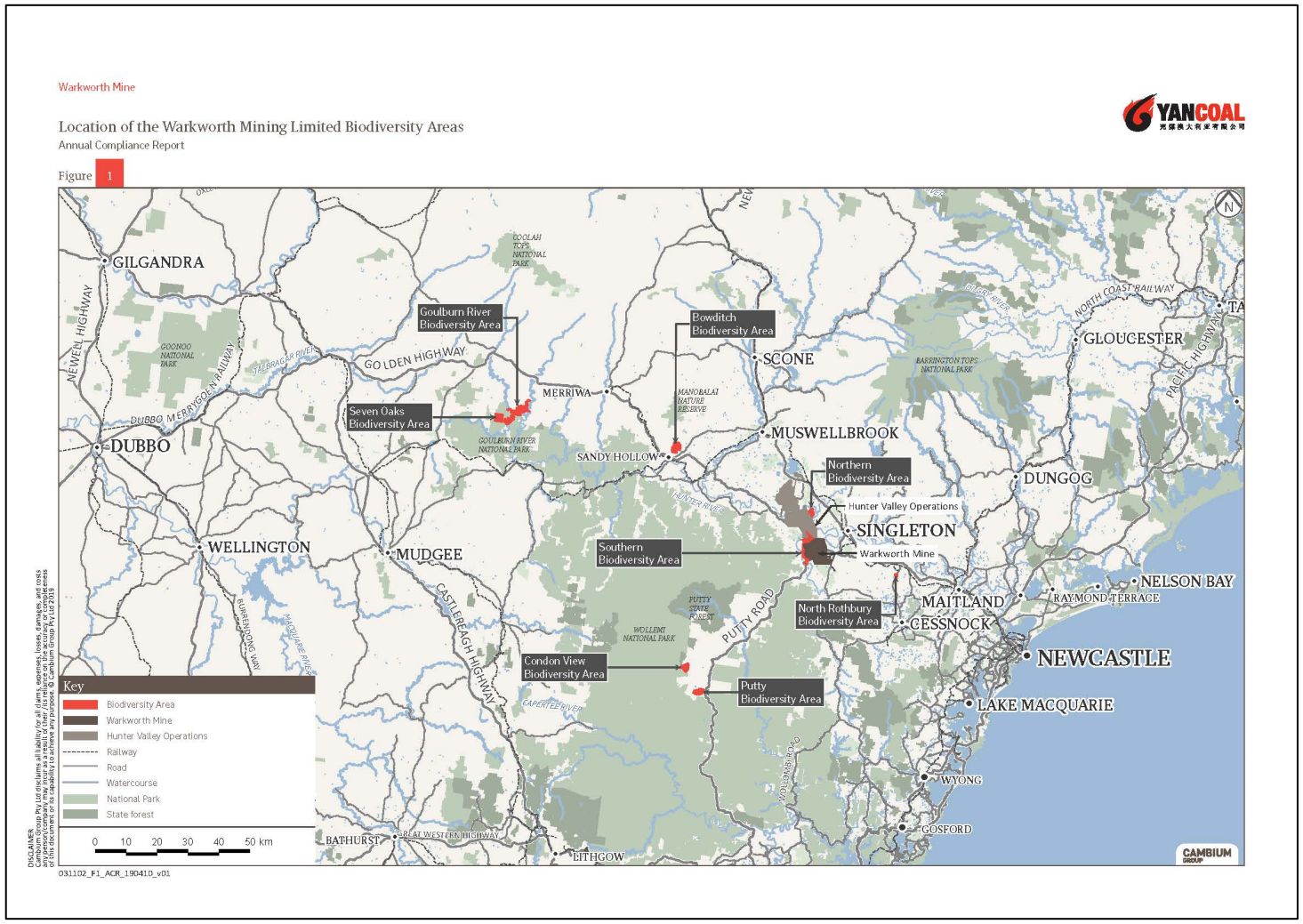


FIGURE 83: MTW BIODIVERSITY OFFSET LOCALITY MAP

7.11.2 Biodiversity Area Management Activities

The OMPs describe the Conservation Management Strategies. The following are the key actions completed throughout 2020 across all the BAs:

7.11.2.1 Weed Control

Weed control at the Local BAs targeted the following species:

- African boxthorn *(Lycium ferocissimum)*
- African lovegrass *(Eragrostis curvulva)*
- African olive *(Olea europaea subsp. Cuspidate)*
- Blue heliotrope *(Heliotropium amplexicaule)*
- Caltrop *(Tribulus terrestris)*
- Castor oil plant *(Ricinus communis)*
- Coolatai grass *(Hyparrhenia hirta)*
- Fat hen *(Chenopodium sp)*
- Farmers friends *(Biden pilosa)*
- Galenia *(Galenia pubescens)*
- Green cestrum *(Cestrum parqui)*
- Lantana *(Lantana camara)*
- Mother of millions *(Bryophyllum delagonese)*
- Paddys Lucerne *(Sida rhombifolia)*
- Paterson's curse *(Echium plantagineum)*
- Prickly pear *(Opuntia stricta)*
- Telegraph weed *(Heterotheca grandiflora)*
- Tiger pear *(Optunia aurantiaca)*

Weed control at the Regional BAs targeted the following species:

- Blackberry *(Rubus fruticosus)*
- Blue heliotrope *(Heliotropium amplexicaule)*
- Bridal creeper *(Asparagus asparagoides)*
- Cat heads *(Emex australis)*
- Caltrop *(Tribulus terrestris)*
- Common Thorn-Apple *(Datura stramonium)*
- Farmers friends *(Bidens pilosa)*
- Fireweed *(Scenecio madagascariensis)*
- Green cestrum *(Cestrum parqui)*
- Lantana *(Lantana camara)*
- Lamb's tongue *(Verbascum thapsus)*
- Lavender scallops *(Bryophyllum fedtschenkoi)*
- Mallow *(Malva parviflora)*

- Mexican Poppy *(Argemone ochroleuca)*
- Mustard weed *(Sisymbrium officinale)*
- Narrow leaf cotton bush *(Gomphocarpus fructicosus)*
- Noogoora burr *(Xanthium occidentale)*
- Paddy's lucene *(Sida rhombifolia)*
- Paterson's curse *(Echium plantagineum)*
- Prickly pear *(Opuntia stricta)*
- Scotch thistle *(Onopordum acanthium)*
- St John's wort *(Hypericum perforatum)*
- Stinking roger *(Tangetes minuta)*
- Tiger Pear *(Optunia aurantiaca)*
- Tree of heaven *(Ailanthus altissima)*
- Variegated thistle *(Silybum marianum)*

7.11.2.2 Infrastructure Management and Improvement

In 2020 fence repairs were undertaken at the Southern, Northern, North Rothbury, Putty, Condon View and Bowditch BAs. A new 1.4 km section of boundary fence was installed at the Goulburn River BA. All tracks were maintained to reduce encroaching vegetation and improve access. Regular property inspections were undertaken on all BAs.

7.11.2.3 Fire Management

The MTW Biodiversity Area Bushfire Management Plan was reviewed in 2020. Slashing of fire breaks was undertaken on the Southern and Goulburn River BAs. Overall fuel load assessments were undertaken on the Local and Regional BAs to identify the current exposure to bushfire fuel hazard and implement a bushfire fuel hazard reduction programme. A Hazard Reduction Burn for North Rothbury BA was approved however weather conditions were outside the prescribed limits, so the burn has been rescheduled for autumn 2021.

7.11.2.4 Strategic Grazing

No strategic grazing was undertaken in the BAs in 2020.

7.11.2.5 Vertebrate Pest Management

Two 1080 ground baiting programmes were undertaken across the Biodiversity Areas targeting wild dogs and foxes in 2020. 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 7.8** summarises the results from the programmes during 2020.

TABLE 7.8 SUMMARY OF VERTEBRATE PEST MANAGEMENT 2020

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)	120	29	12	2	3
Spring (Local BAs)	120	50	5	2	12
Autumn (Regional BAs)	184	45	31	11	12
Spring (Regional BAs)	174	38	22	30	36
Total	**598**	**162**	**70**	**45**	**63**

Additional pest management programmes included:

- Noisy Miner ground shoot at the Goulburn River BA to assist the survivability of the Regent Honeyeater: 212 Noisy Miners controlled over a seven-day programme under Licence to Harm Protected Animals (Biodiversity Conservation Act 2016). This is the fourth consecutive year of this programme making this the longest running and most successful noisy miner management programme in the country. The 2020 programme expanded the treatment area to include the whole BA and monitoring results conclude that ongoing noisy miner management is successfully suppressing noisy miner numbers at the Goulburn River Biodiversity Area.
- Opportunistic shooting of other vertebrate pests included two feral pigs.
- Aerial shoot conducted by NPWS controlled 14 feral pigs at the Goulburn River BA in October.
- The Professional Wild Dog Controller Programme has trapped and euthanised more than 360 problem wild dogs in the three years it has been running. This is a four-year programme with the primary goal to reduce the impacts of wild dog predation on livestock production, the social wellbeing of livestock producers, and native fauna, through professional and targeted control of problem dogs in the Upper Hunter district. A total of 19 wild dogs have been controlled on Yancoal land since July 2017.

Vertebrate pest management programmes will continue to be carried out during 2021 to limit feral pest impacts on landholdings and surrounding neighbours.

7.11.2.6 Seed Collection

Seed collection was undertaken by contractors in the Northern and Southern BAs during 2020, focussing on the WSW, River Oak Forest and Ironbark vegetation community. Seed collection was also undertaken on the Goulburn River BA for Yellow Box – Grey Box – Red Gum grassy woodland and River Oak riparian woodland. Tube stock for 2021 plantings is currently being propagated from the seed collected.

7.11.2.7 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.

In 2020, restoration work included infill planting Central Hunter Grey Box – Ironbark Woodland and River Oak Forest in the Southern BA and with 7,000 tube stock planted into rip lines. Infill of 2,000 tube stock was planted into Warkworth Sands Woodland plots in the Southern BA. Warkworth Sands Woodland 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. The additional sand was stockpiled and will be spread into strips and seeded with native grass and planted with tubestock in 2021.

Infill planting at the Goulburn River Biodiversity area to increase the suitability of habitat for the Regent Honeyeater continued with 12,000 tube stock planted into the cleared areas of Yellow Box – Grey Box – Red Gum Grassy Woodland and riparian woodland areas. Access to the site was restricted during 2020 due to high river levels, which meant that not all areas could be accessed for infill planting in 2020. Supplementary infill planting will continue in 2021.

The next round of planting is planned for autumn 2021 and will include 11,000 Warkworth Sands Woodland tubestock in the Northern BA and 4,400 in the Southern BA. Additional infill of the Central Hunter Grey Box – Ironbark Woodland and River Oak Forest planting areas at the Southern BA will continue as required.

FIGURE 84: DRONE IMAGE OF NORTHERN BIODIVERSITY PLANTING AREA

FIGURE 85: WARKWORTH SAND WOODLANDS PLANTING STRIP NORTHERN BIODIVERSITY AREA

7.11.2.8 Bird Assemblage 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 204 two-hectare 20-minute bird surveys were conducted during the winter and early spring period, to cover the period when swift parrots and regent honeyeaters are most likely to be present on site. A total of 124 species of birds were recorded throughout the eight Biodiversity Areas (BAs). Bird species richness has increased by eight species on 2016 data and by two species on 2018 data.

Three regent honeyeaters - two males and a female- were detected at the Putty BA. This is the first confirmed record of regent honeyeater utilising habitat within the Putty BA. A single male regent honeyeater was also detected on the Goulburn River BA, though not during formal bird monitoring surveys and not within an established monitoring site. No swift parrots were detected occupying any of the Biodiversity Areas. Overall bird activity was likely affected by lagged effects of drought, namely a lack of eucalypt blossom and vegetation dieback.

FIGURE 86: REGENT HONEYEATER AT PUTTY ©LIAM MURPHY.

7.11.2.9 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 2020 and demonstrated that exotic cover had increased across all properties except the North Rothbury and Bowditch BAs.

The North Rothbury and Bowditch BAs had most key attributes close to or within benchmark indicating a high potential for regeneration across the site. Seven Oaks, Condon View and Putty BAs had some key attributes within benchmark values demonstrating that previously disturbed areas show potential for successful regeneration and overall restoration.

Some monitoring sites at the Goulburn River BA were inaccessible due to high river levels and these have not been included in the 2020 monitoring programme. The Goulburn River BA showed that regenerating woodland areas are in a good condition with most key attributes meeting or close to benchmark. The cleared grassland areas were however well below benchmark. Infill planting to increase the suitability of habitat for the Regent Honeyeater was undertaken in 2019 and 2020 with tube stock planted into the cleared areas of Yellow Box – Grey Box – Red Gum Grassy Woodland and riparian woodland areas. Weather conditions during this time have impacted the survival rates so additional supplementary planting has been scheduled for 2021.

The Northern and Southern BAs had a high level or variability in the condition of the grassland areas. Additional planting of woodland species has been scheduled for 2021. The woodland areas were near benchmark condition.

7.11.2.10 Rapid Condition Assessments

The Rapid Condition Assessment technique is used 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.

7.12 Audits and Reviews

The NSW Resources Regulator undertook a Targeted Assessment Program (TAP) at MTW on 26 June 2020 which focused on soils and materials management in relation to rehabilitation activities. The TAP program has been introduced ahead of rehabilitation reforms that are expected to be introduced as regulation in 2021. During the TAP, MTW was assessed on its preparedness to implement the requirements of the proposed rehabilitation reforms. The opportunities for improvement identified in the TAP report will be included in a Rehabilitation Management Plan that will be prepared in

accordance with the guidelines proposed under the rehabilitation reforms; and implemented during 2021.

An Independent Environmental Audit (IEA) was conducted at MTW during 2020. A summary of progress for implementation of the IEA recommendations has been included in **Appendix 7**.

8 COMMUNITY

8.1 Complaints

A total of 235 complaints were recorded during the reporting period, with a decrease of approximately 39% compared to 2019. The 235 complaints were registered by approximately 39 people (some complainants remained anonymous), with just over 71% of complaints received from 7 individuals. Most complaints were received from residents in the Bulga area. A breakdown of complaints by type is shown in **Table 8.1**.

Noise remains of key concern for near neighbours. There has been a trending decrease (overall 42.7%) in noise complaints from 2018. The decrease experienced from 2018 is considered partially attributed to increased noise measurements undertaken by the Community Response Officers from 2018 to 2020 and corresponding mitigating actions taken where required.

Dust has reduced as a key concern for the community. 2020 showed a significant decrease of complaints regarding dust by ~79% in comparison to 2019. The decrease from 2019 may be attributed to the above average rainfall conditions in 2020 (828 mm) in comparison to the below average rainfall in 2019 (304 mm) and 2018 (457 mm).

The average annual rainfall recorded at MTW's Charlton Ridge Meteorological station is 646mm, as calculated from 2007 to 2020 annual totals.

Lighting has emerged as a key concern for the community. 2020 showed an increase of complaints regarding lighting by 33% in comparison to 2019. This increase from 2019 may be partially attributed to the progression of mining in the Warkworth Pit, which is progressively removing natural topographical shielding, as well as normal dumping activity on elevated dumps.

In summary:

- 43% reduction in noise complaints;
- 79% reduction in dust complaints;
- Blasting, Water and Other related complaint numbers have remained fairly consistent since 2018, although lighting related complaints were higher than in 2019.;
- Complaints in the "Other" category decreased from 2019. Complaints in this category were in relation to odour.

TABLE 8.1 SUMMARY OF COMPLAINTS BY TYPE FOR 2018 TO 2020

Complaint type	2020	2019	2018
Noise	98	112	171
Blasting	68	94	69
Dust	30	146	76
Lighting	36	27	32
Water	0	0	0
Other	3	6	3
Total	235	385	351

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 (www.insite.yancoal.com.au) 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;
- 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 2020, 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 has worked to upgrade this facility to support the business sustainability;
- 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. Over two weeks in September, primary school children from St Catherine's Catholic College visited MTW to tour the operation.

8.2.2 Community Consultation Committee

The MTW CCC met on a quarterly basis to discuss our 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 (www.insite.yancoal.com.au). 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.

MTW advertised for new members to join the CCC over a period between 27 November 2019 to 17 January 2020. Advertisements were placed in the Singleton Argus Newspaper, in local businesses in Bulga, and at the Singleton Council offices. In addition, the local community near MTW were directly sent a letter advising that an opportunity to apply to join the MTW CCC was available. MTW's Independent Chair accepted the applications and gained DPIE Secretary approval for new members and alternate members on 23 March 2020.

During the reporting period the CCC members were:

- Dr Col Gellatly - Independent Chair
- Cr Hollee Jenkins - Singleton Council Representative
- Mr Adrian Gallagher – Community Representative
- Mr Ian Hedley – Community Representative
- Mr Stewart Mitchell – Community Representative
- Ms Antoinette Silk – Community Representative (DPIE endorsed 23/3/2020)
- Mrs Barb Brown – Community Representative (DPIE endorsed 23/3/2020)
- Mr John Lamb – Community Representative (DPIE endorsed 23/3/2020, resigned 25/11/2020)

- Mr Neville Hodkinson – Stakeholder Representative - Singleton Shire Healthy Environment Group (DPIE endorsed 23/3/2020)
- Mr Graeme O'Brien – Community Representative (Alternate - DPIE endorsed 23/3/2020)
- Mr Denis Maizey – Community Representative (Alternate - DPIE endorsed 23/3/2020)

Company representatives attending the CCC included:

- Mr Jason McCallum - MTW General Manager
- Mr Gary Mulhearn – MTW Environment & Community Manager
- Mr David Bennett – MTW Mining Manager (and Acting General Manager)
- Mr John Campbell – MTW Technical Services Manager
- Ms Olivia Lane – MTW Environment & Community Coordinator
- Ms Claire Bennis – MTW Community Response Officer

8.2.3 Community Support and Development

In 2020, 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 2020, 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 2020, MTW contributed a further $800,000 excluding GST, bringing total VPA contributions at end of 2020 to $5.2M 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 of the VPA funds. During 2020, the committee was chaired by Mayor Sue Moore and includes senior staff from Council, community representatives, and a Yancoal representative. Pleasingly, there have been several projects approved in the Bulga area from the Bulga Community Project Fund which includes:

- Bulga Recreation Grounds improvements and exercise equipment (which officially opened on 19 March 2020);
- Bulga Hall improvements (new media system, ceiling upgrade, verandah/store room upgrade);
- Old Bulga School restoration;
- Electronic message board; and
- Bulga Stock Reserve ongoing developments (including development of plan of management).

8.2.3.2 MTW Community Support Program

In 2020 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, closing 4 November 2019 for the 2020 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.

In 2020, many events being supported had to postpone their timing into 2021 due to COVID-19 restrictions. In 2020, MTW proposed to support the following local projects and initiatives:

- University of Newcastle Scholarship Program
- University of Newcastle Upper Hunter Science and Engineering Challenge (COVID19 – Support held for 2021)
- Rotary Club of Singleton on Hunter – 2020 Singleton Art Prize (COVID19 – Support held for 2021)
- Singleton Schools Learning Community – Visible Wellbeing Project (VWB techniques help teachers to use the learning process itself as a delivery mechanism to build student wellbeing - for teachers and students in all Singleton schools)
- Singleton Business Chamber – 2020 Singleton Business Excellence Awards (COVID19 – Support held for event – planned for November 2021)
- Westpac Rescue Helicopter Service – Hunter Valley Mining Charity Rugby League Competition 2020 – (COVID-19 - Support held for event in March 2021)
- Newcastle & Hunter Combined Schools ANZAC Service – 2020 Singleton ANZAC Service (COVID-19 – support held for 2021 event)
- Singleton Theatrical Society – 2020 Annual Musical (COVID19 – Support held for 2021)
- United Elizabeth Gates Village Auxillary – Shower Commode Chair
- Glennies Creek Rural Fire Service –Genfo Knapsacks
- Singleton District Girl Guides – Camping Kitchen Supplies
- Howes Valley Rural Fire Service – Whitegoods for RFS station kitchen update
- Singleton Golf Club Lady Members – Annual Ladies Day Open 2020
- Wildlife Aid Inc - Support for Wildlife care and rescue
- Northern Agriculture Association Inc - 2020 Singleton Show (cancelled due to COVID-19)
- Samaritans Foundation – Christmas Lunch in Singleton 2020

MTW also advertised the opportunity for 2021 CSP funding during 2020. Applications closed 6 November 2020 and progress with community support program initiatives will be provided in the next reporting period.

9 INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit (IEA) of MTW was conducted in April 2020 to satisfy Schedule 5, Condition 9 of both the Warkworth Mining Limited (SSD-6464) and Mount Thorley Operations (SSD-6465) Development Consents, which require an IEA to be undertaken "*within 1 year of the commencement of development under this consent, and every 3 years thereafter*", and an audit report submitted "*within 6 weeks of the completion of this audit*.".

The audit focused on the site's compliance with the conditions of; Development Consent's, Environmental Protection Licences, Coal and Mining Leases and supporting documents including management plans, covering the period 5 May 2017 to 30 April 2020.

This IEA identified some non-compliances against conditions of Development Consent SSD 6464 and SSD 6565, and other licences and approvals. Of the 28 non-compliances against a condition of a licence or approval identified, 13 were low risk and eight were identified as administrative in nature. The remaining seven non compliances were assessed to be medium risk. No high risk findings were identified in the audit.

At the time of the audit, MTW were aware of the identified non-compliances against conditions, licences and approvals and were actively working to address a number of the issues identified in the audit report. An update of progress against the Action Plan developed in response to the 2020 Independent Environmental Audit is included in **Appendix 7**.

The environmental audit report and MTW's response to recommendations are available in full on the company website (https://insite.yancoal.com.au/document-library/audits-mtw).

The next MTW Independent Environmental Audit is due in 2023.

10 INCIDENTS AND NON-COMPLIANCE

A summary of the environmental incidents reported during 2020 are provided in **Table 10.1** below

TABLE 10.1 ENVIRONMENTAL INCIDENT SUMMARY 2020

Date	Incident Details	Follow up Actions
9 February 2020	Discharge from two boundary dams at Warkworth (Dam 50N and Dam 53N) as a result of a greater than design rainfall event. A total of 91.4mm of rainfall was recorded during the incident period from 6 February to 9 February 2020. Notifications to the relevant regulatory authorities was undertaken, in accordance with the MTW Pollution Incident Response Management Plan (PIRMP).	Investigation undertaken by MTW into both discharges. MTW submitted an incident report to EPA and DPIE associated with the discharge event. Dewatering of Dams 50N and Dam 53N continued throughout the duration and post the rainfall event to the sites mine water management system to dewater both dams to their lowest operating levels. Water samples were also collected from monitoring sites during the event and analysis results obtained. MTW utilised the boundary dam monitoring system, installed in 2019, to assist with management of the sites remote boundary dams.
14 May 2020	Discharge from one boundary dam at Mount Thorley (Dam 9S) via spillway to Loders Creek. The overtopping event occurred as a result of a fault of a level sensor which caused the automatic valve between Dam 6S and Dam 9S to remain open, permitting Dam 9S to fill and overtop. Notifications to the relevant regulatory authorities was undertaken, in accordance with the MTW Pollution Incident Response Management Plan (PIRMP).	Containment actions were implemented immediately to cease the overflow. Dam 9S levels were lowered. Automated decant infrastructure between Dam 6S and Dam 9S was placed into manual mode. An external investigation was undertaken to determine the cause and contributing factors of the overtopping incident. The corrective actions and recommendations from the external investigation report are being implemented to prevent reoccurrence. The incident report was provided to the Department of Planning, Industry and Environment, to the EPA and to the Resources Regulator on 21 May 2020.

On the 17 December 2019 the EPA conducted drone surveillance of WML regarding dust generation at the premise, this included haul truck generated dust. The EPA issued a Show Cause notice in relation to their observations on the 3 March 2020. WML received an Official Caution on 26 May 2020 in

relation to wheel-generated dust from haul trucks operating at WML. The Official Caution was in relation to Condition O3.2 of Environmental Protection Licence 1376.

MTO received an Official Caution from the EPA in October 2020 in relation to the water discharge (Dam 9S) incident reported to the EPA and DPIE on 14 May 2020. Details of the incident are provided above in **Table 10.1**. The Official Caution was in relation to section 120 of the Protection of the Environment Operations Act (POEO) 1997.

11 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Yancoal will endeavour to carry out the following activities during the 2021 reporting period at Mount Thorley Warkworth, as outlined in **Table 11.1**.

TABLE 11.1 PROPOSED ACTIVITIES FOR 2021 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 • Undertake quarterly comparison of real time and external noise monitoring to validate real time monitoring results.
2	Blasting	• Review and revise the MTW Blast Management Plan for operational changes at MTW. • Implementation 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
3	Air Quality	• Engage an air quality consultant to clarify whether extrapolation from the current air quality monitoring network data provides representative data to inform tenants of the particulate emissions at their residence or if additional monitoring is required. Any outcomes will be assessed and implemented where required.

ID	Performance Area	Activities Proposed
4	Aboriginal Cultural Heritage	• Ongoing Aboriginal archaeological and cultural heritage management activities will occur in 2021 in accordance with current management plans, to inform ongoing land management and development planning. This will include the relocation of the Site M grinding grooves from the Putty Road Storage facility to the WBACHCA & the salvage of those Aboriginal artefact sites located within the ACHMP Area in areas required for mine development. Condition monitoring of those sites peripheral to authorised disturbance areas will be conducted annually to ensure operational compliance with the ACHMP. • Conservation Agreements for the Wollombi Brook and Loders Creek Aboriginal Cultural Heritage Conservation Areas will be progressed in 2021. • Relocation of the three cultural scar trees from the active mining area will be undertaken in consultation with the relevant stakeholders. • In accordance with the AHMP MTW has engaged a consultant to complete a reconciliation of aboriginal cultural heritage data during the 2021 reporting period. • The WBACHCA PMIG meetings are planned to commence during the 2021 reporting period to begin actioning the WBACHCA plan of implementation.
5	Historic Heritage	• Implementing the MTW complex-wide HHMP developed in accordance with the conditions of the Warkworth & Mount Thorley Development Consents, which will guide the management of historic heritage. • MTW has engaged a contractor to undertake quarterly grounds maintenance at Springwood and Red Brick historic heritage houses. • Treatment of the cat claw creeper vine will be commenced during the 2021 reporting period at Springwood followed by a structural building inspection. • Replacing window and door sheeting and any loose roofing is planned for completion at the Red Brick house during the 2021 reporting period. • Track maintenance into the RAAF Mess Hall is planned for completion during the 2021 reporting period to allow access for future works. During the 2021 reporting period tree lopping, asbestos removal and a structural building inspection are targeted for completion.

ID	Performance Area	Activities Proposed
6	Water	• Improving the general capacity of the site's water resources via construction and/or upgrades of approved tailings storage and water storage facilities (NOOP and Loders Pit TSF). • Implementation of actions/recommendations from the annual groundwater review. • Develop an action plan to address the findings of the annual stream health assessment for Loders Creek. • Construct NPN water management infrastructure to reduce risks associated with stormwater management in this zone. • Completion of sediment control water management infrastructure ahead of mining pre-strip area. • Improve the separation of water classifications (mine, sediment, clean) on site to reduce risks associated with stormwater management. • Install additional boundary dam monitoring equipment on the Warkworth sediment dams. • Update the operational site water balance and model.
7	Rehabilitation	• The rehabilitation monitoring programme will continue in 2021 for native vegetation rehabilitation areas. The monitoring program will be varied to align with changes to MOP performance criteria resulting from Independent Rehabilitation Review (Emergent Ecology 2019) recommendations. • Maintenance activities are planned to result in approximately 87ha of rehabilitation, currently in the initial stage of cover cropping, being seeded with the full native seed mixes. Weed spraying (boom and spot spraying) 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 35ha of new rehabilitation will be undertaken at MTW during 2021. • Habitat augmentation measures, such as the construction of habitat ponds and the placement of salvaged logs in rehabilitation areas. • Capping of Tailings Dam 2 will be progressed during 2021 in accordance with the revised capping methodology developed by Australian Tailings Consultants. The capping method being utilised on TD2 was reviewed and updated following settlement cracking of the capping layer in an area of TD2 in 2017. • Capping of the Interim TSF will continue during 2021 using breaker rock from the South CHPP as the initial capping layer.

ID	Performance Area	Activities Proposed
8	Biodiversity Management	• Planting works will continue to restore Warkworth Sands Woodland and Central Hunter Grey Box – Ironbark Woodland in the Northern and Southern BAs. Supplementary planting to re-establish the cleared land in the Yellow Box – Grey Box – Red Gum Grassy Woodland to a Box Gum Grassy Woodland community and increase the suitability of habitat for the Regent Honeyeater in the River Oak riparian woodland will continue at the Goulburn River Biodiversity Area. • Conservation management actions will be undertaken across the BAs in 2021 in accordance with the Offset Management Plans, these will include weed management in autumn and spring. Vertebrate pest management including 1080 ground baiting programmes to target wild dogs and foxes scheduled for autumn and spring across all BAs, 1080 baiting targeting feral pigs at the Goulburn River BA and a noisy miner control in the regent honeyeater breeding area at the Goulburn River BA. Rapid Condition Assessments, Overall Fuel Load Assessments and property inspections will be undertaken across all BAs. The hazard reduction burn for North Rothbury has been scheduled for autumn. Fence and waste removal will be undertaken at the Northern and Condon View BAs. Infrastructure improvement including fence repairs and track maintenance will be undertaken as required. • Progress the securing of biodiversity offset areas using the methods detailed in the relevant state and federal biodiversity approvals.
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 2021 after closing date in November 2020 and seeking applications from the local community for 2021 funding. The CSP program will provide 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.

Appendix 1:

Aboriginal Heritage Management Plan Compliance Inspection Report

Appendix 2:

Historic Heritage Management Plan Compliance Inspection Report

Appendix 3:

Annual Stream Health and Stability Report

Appendix 4:

Annual Ground Water Review Report

Appendix 5:

Annual Rehabilitation Report Summary Table

Appendix 6:

Rehabilitation and Disturbance Summary

Appendix 7:

IEA Action Status Table