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

Mount Thorley Warkworth

2019 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	14/12/2018
MOP/RMP end date	30/11/2021
Annual Review Start Date	01/01/2019
Annual Review End Date	31/12/2019

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 2019 to 31 December 2019 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	5/6/2020

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 2019 to 31 December 2019.

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 2019 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 17.6 million tonnes of run-of-mine (ROM) coal during 2019, and 12.0 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 an increase (from 38 to 94) in the number of supplementary attended noise measurements which exceeded the internal trigger levels for corrective action compared to 2018. A total of up to 1,203 hours of mine stoppages were recorded due to proactive and reactive measures to minimise noise.

Blasting

During the reporting period 250 blast events were initiated at MTW. There was one non-compliance against ground vibration criteria, and one non-compliance against airblast overpressure criteria.

On 4 April 2019, one blast exceeded the 120dB(L) threshold for airblast overpressure (AOP) at the Warkworth blast monitor. The exceedance was reported to DPIE and to the NSW Environment Protection Authority (EPA) on 5 April 2019. A written report was provided to the DPIE and EPA for this blast which concluded that "The reason that the AOP level that resulted at the Warkworth monitoring station was greater than predicted was due to the fact that the actual meteorological data, and hence the actual effects of meteorology, were different from that predicted." WML received a penalty notice for the AOP exceedance incident, which was received in September 2019. The penalty notice was issued by DPIE for a non-compliance of the blasting limits of the Warkworth Development Consent (SSD 6464). Further details on this incident and the actions taken by MTW are provided in **Section 10.**

At the end of the 12 month 2019 calendar year, there were a total of 16 blast events initiated at MTO, of which a single blast vibration result at the Wollemi Peak Road monitor was recorded in the range of 5-10mm/s (actual result 5.67mm/s). Due to the small number of blasts at MTO, this has resulted in 6.3% of blasts at the Wollemi Peak Road monitoring location being in the range of 5-10mm/s, which is greater than the requirements of development consent SSD-6465 which permits up to 5% of blasts to record in the range of 5-10mm/s. The non-compliance was reported to DPIE and to the EPA (via the MTO Annual Return). Further details on this incident and the actions taken by MTW are provided in **Section 10.**

Air Quality

During 2019, MTW complied with all short term and annual average air quality criteria. A total of 6,762 hours of mine stoppage was recorded following implementation of proactive and reactive measures to minimise dust.

Heritage

Although no Aboriginal or historic heritage assessments or salvage programs were conducted at MTW in 2019, heritage matters continued to be managed in accordance with the MTW Aboriginal Cultural Heritage Management Plan (ACHMP) and Historic Heritage Management Plan (HHMP).

Annual ACHMP and an HHMP compliance inspections were conducted during the 2019 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.

One new cultural heritage site (artefact scatter) was identified and recorded during the reporting period in accordance with the provisions outlined in the ACHMP.

Surface Water

2019 was a drier than average year with a total of 303.8 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.

There were no new water management structures constructed during the reporting period at MTW.

There was one externally reportable water related incident during the reporting period which occurred on 30 March 2019. The incident involved the overtopping of two boundary dams at Warkworth (Dam 46N and Dam 53N) as a result of a greater than design rainfall event (52 mm). WML received two penalty notices for the water discharge incident, which were received in August 2019. One penalty notice was issued by the EPA for a breach of EPL 1376 and a second penalty notice was issued by DPIE for a breach of the Warkworth Development Consent (SSD 6464). An official caution was also received from the EPA in September 2019. Further details on this incident and the actions taken by MTW are provided in **Section 10.**

Groundwater

Groundwater monitoring activities were undertaken in 2019 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 2019.

Visual Amenity

The Putty Road visual bund was extended to the west, to the junction of the Sealed Geo Road (former Wallaby Scrub Road), during 2019. Vegetation screening has also been implemented to the west of the former Wallaby Scrub Road to improve visual amenity for passing motorists. A section of deceased trees along the South Pit of Warkworth adjacent to the Putty Road were also removed in 2019 to improve visual amenity, with infill planting to occur in 2020 in this area.

Rehabilitation and Land Management

A total of 82.7 ha rehabilitation was completed during 2019 against a MOP target of 82.1 ha. Total disturbance undertaken was 99.7 ha, higher than the 2019 MOP projection of 79.2 ha. The additional reported disturbance was due to re-classification of topsoil stockpiles from rehabilitation to disturbed land. This re-classification of rehabilitation resulted from an independent review of rehabilitation progress at MTW that was commissioned in response to section 240 notices issued by the Resources Regulator on 5 July 2019. Tailings Dam 2 closure activities continued with capping completed on a portion of the southern area of the tailings beach. This allowed for 2.2 ha of rehabilitation to be completed on the Tailings Dam 2 footprint.

The net rehabilitation progress (i.e. rehabilitation minus rehabilitation disturbance) for the current MOP period (2015 to 2019) is 347.8ha, which is 35.6ha lower than the MOP target of 383.4ha. The net rehabilitation result has also been affected by the reporting of rehabilitation disturbance to account for the re-classification of topsoil stockpiles from rehabilitation to disturbed land. Cumulative new disturbance over the MOP period is 377.9ha which is lower than the MOP forecast of 388.5ha for the same period.

Biodiversity and Offset Management

Restoration of the Warkworth Sands Woodland vegetation community continued in the Northern Biodiversity Area, with over 3,000 seedlings 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 over 20,000 seedlings planted. Planting at the Goulburn River Biodiversity area to increase the suitability of habitat for the Regent Honeyeater commenced with 17,000 tube stock planted into the existing cleared areas of Yellow Box – Grey Box – Red Gum Grassy Woodland and riparian woodland areas. Weed control, vertebrate pest management activities, seed collection, and fence repairs were conducted during 2019 in the Local and Regional 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-6464 (WML)	Schedule 3 Condition 27	Water Management Plan	Non-compliant	6.7.3
SSD-6464 (WML)	Schedule 3 Condition 8	Blasting Criteria	Non-compliant	6.3.2
SSD-6465 (MTO)	Schedule 3 Condition 6	Blasting Criteria	Non-compliant	6.3.2

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 2019 to 31 December 2019.**

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 the 2019 Annual Review aligns with the *DPIE Post-approval requirements for State significant mining developments – Annual Review Guideline* (October 2015).

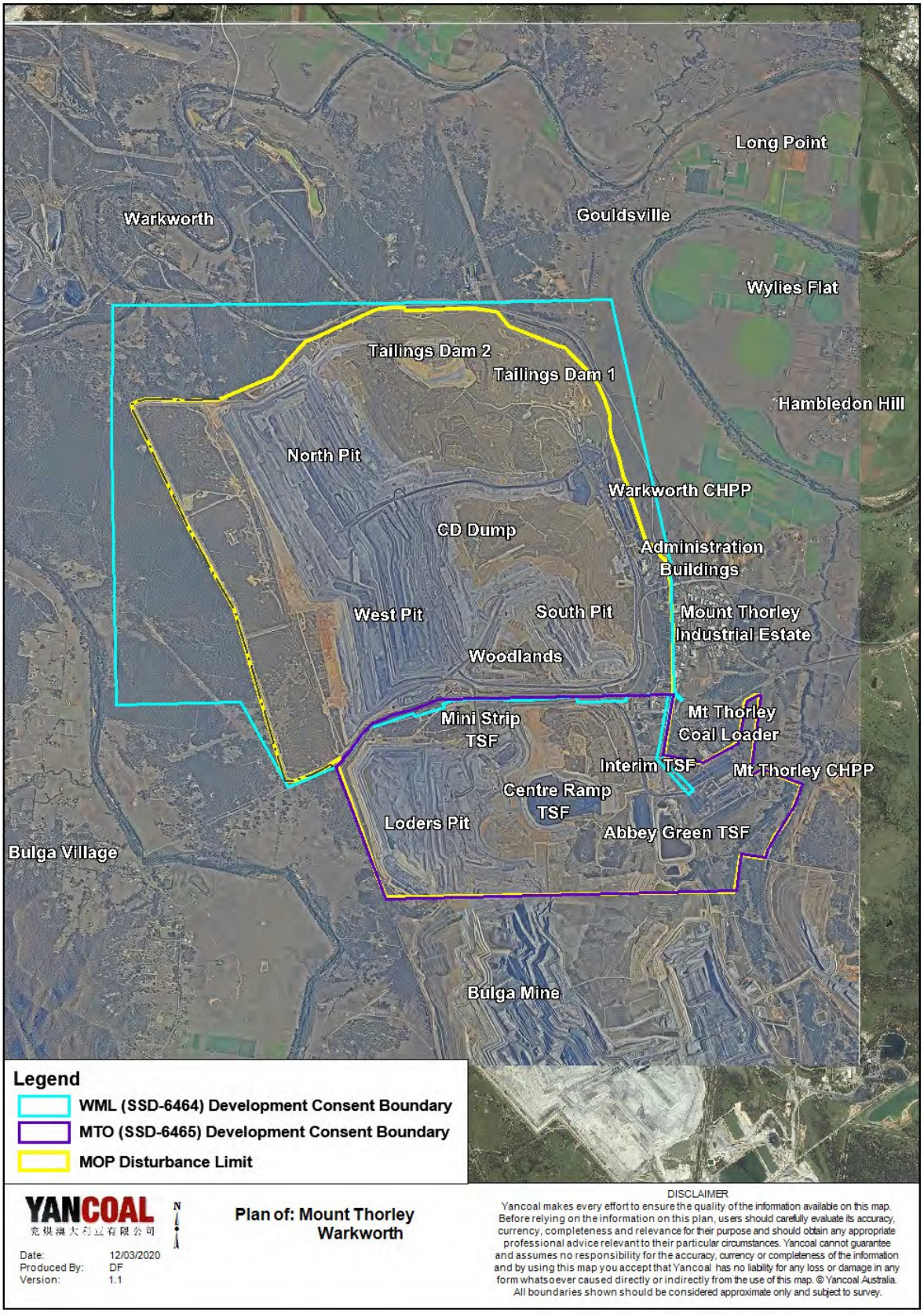


FIGURE 1: MTW SITE LAYOUT AND LOCALITY PLAN

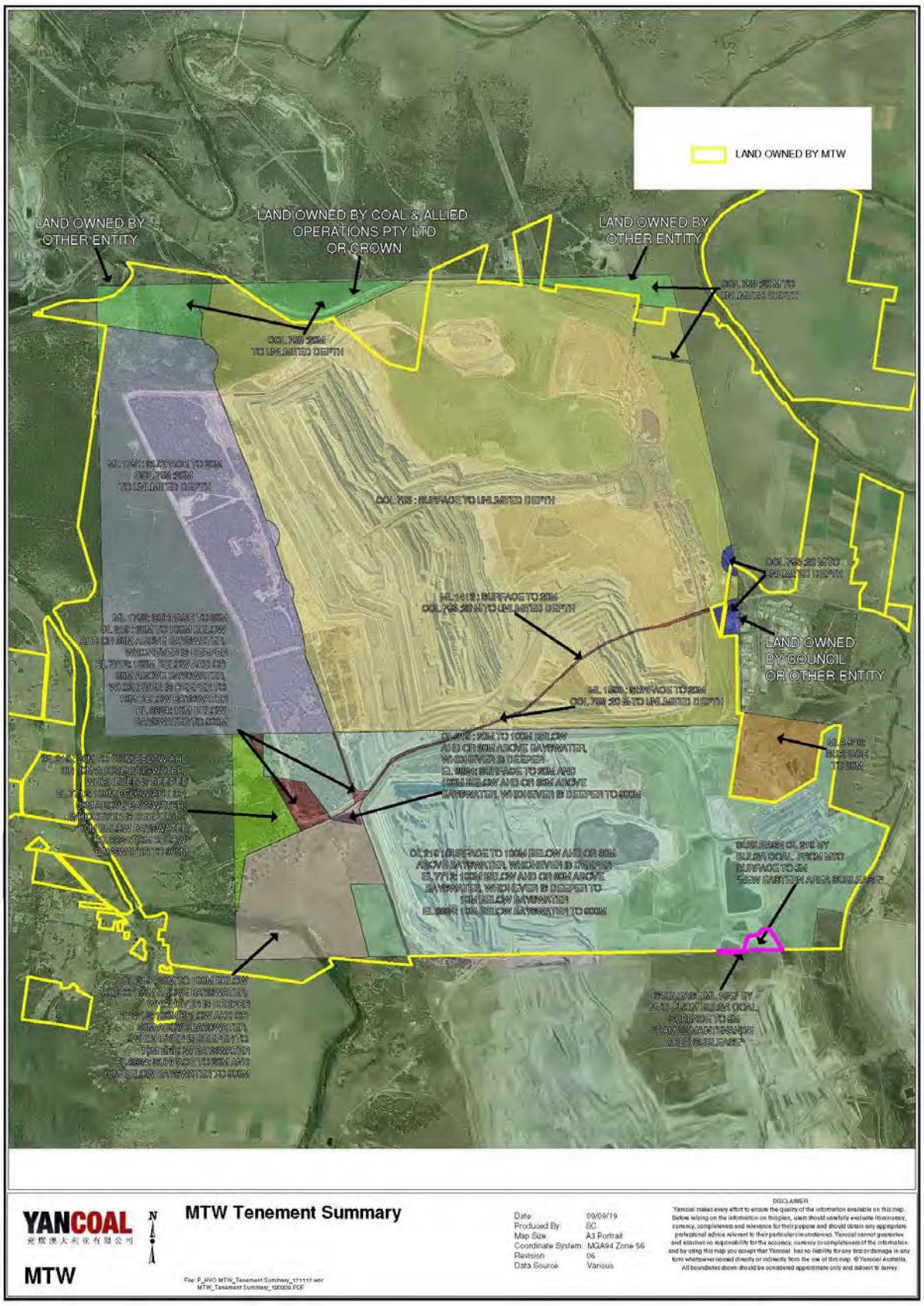


FIGURE 2: MTW TENEMENT SUMMARY

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	Jason McCallum	(02) 6570 1501
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 2019 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	28/02/2020
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	26/04/2019
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					
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					
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	Granted (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 Limited					
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	23 August 2020
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

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
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

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Licence Allocation (ML)*
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	20/09/2018
WML Biodiversity Management Plan	20/09/2018
Rehabilitation Management Plan (addressed in MOP)	11/06/2019 (MOP Amendment B)
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
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)

Plan / Program / Strategy	Status (approval date)
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

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.

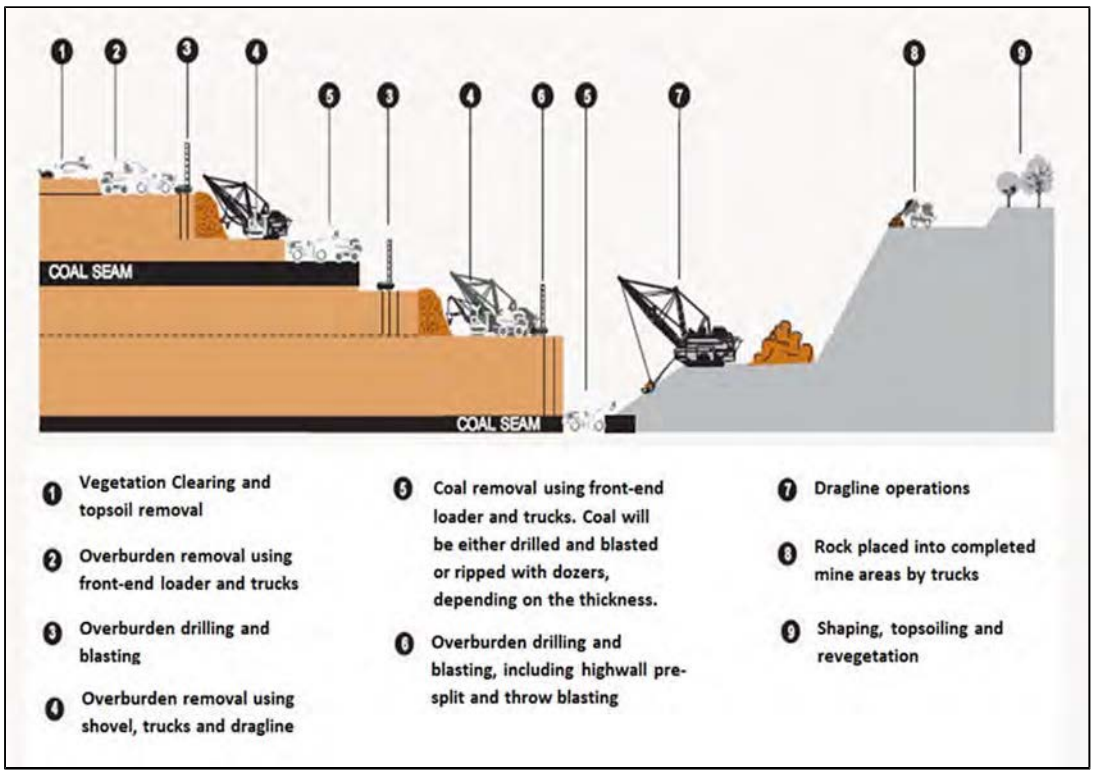


FIGURE 3: MINING PROCESS

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. This area is currently being utilised for dumping activity. Within Mount Thorley, two small areas in the northern and southwestern extents of the mining lease will reach their final limits during 2020 with remaining reserves to be mined to depth during 2020. 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 2020 production and waste schedule for MTW is summarised below:

- 18.1 Mt ROM coal;
- 12.3 Mt Product coal;
- 127 Mbcm overburden (including rehandle); and
- 5.5 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 2019 were consistent with the approved MOP and no changes were made to the processing and rejects/tailings disposal methods.

Currently active tailing emplacements include the Centre Ramp Tailings Storage Facility and Abbey Green South 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 2019 capping works on Tailings Dam 2 continued.

4.3 Production Statistics

Approved extraction of up to 28 million tonnes of ROM coal from MTW is permitted in a calendar year, 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 2019

Material	Approved Limits	Reporting Period 2018	Reporting Period 2019	Forecast for 2020
Prime Overburden Waste (kbcm)	N/A	98,568	96,765	107,119
MTO ROM Coal (Mtpa)	10 (SSD-6465)	3.02	0.71	0.57
WML ROM Coal (Mtpa)	18 (SSD-6464)	14.59	16.90	17.57
ROM Coal (Mtpa)	28 (Combined)	17.61	17.61	18.14
Coarse Reject (kt)	N/A	4,306	4,236	4,437
Fine Reject – Tailings (kt)	N/A	1,070	1,196	1,109
Product (kt)	N/A	12,121	12,000	12,317

All product coal was transported by rail. MTW transported 11,910 kt of product coal via rail during the 2019 reporting period.

4.4 Summary of Changes (Developments and Equipment Upgrades)

In 2019 a Liebherr R9800 excavator was purchased ultimately as a replacement for Shovel 342 (P&H 4100A) which is nearing the end of its life.

5 ACTION(S) REQUIRED FROM PREVIOUS ENVIRONMENTAL MANAGEMENT REVIEW

An annual environmental inspection was undertaken by the Resources Regulator on 17 June 2019. **Table 5.1** below summarises the actions required following this inspection. The actions were required to be completed by 30 September 2019.

TABLE 5.1 ACTION(S) FROM/FOLLOWING THE PREVIOUS ANNUAL REVIEW

Action Required	Requested by	Section of Annual Review
Engage a suitably qualified independent person(s) to prepare and submit a report (Report) to the satisfaction of the Regulator which: 1. assesses the adequacy of progressive rehabilitation strategies carried out within Authorisations CL 219 and CCL 753 (Mining Act 1973), ML 1412, ML 1590, ML 1751, Ml 1752 (Part) and ML 1547 (Mining Act 1992) and performance against the implementation of those progressive rehabilitation strategies to date. The assessment must assess performance at each phase of rehabilitation as specified in the approved Mining Operation Plan (MOP). 2. provides a plan(s) displaying the status of progressive rehabilitation within the Authorisations. This must include: 1. The rehabilitation domains as described in the MOP and provide a general background for each, including area, rehabilitation commencement year, target revegetation type (i.e. whether pasture or woodland); 2. The current rehabilitation phase for each domain; 3. The current expected year of completion of each rehabilitation phase for each domain until relinquishment of the Authorisations. 3. outlines any proposed measures or actions to improve progressive rehabilitation performance within the Authorisations. 4. provides a timeline and outline of the implementation of works for the proposed measures/actions.	Resources Regulator, NSW Department of Planning, Industry and Environment	7.12

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 2019 noise performance metrics are shown below:

- Community noise complaints received – reduced by ~35% from 2018
- Number of Community Response Officer (CRO) (supplementary) noise measurements which exceed the internal trigger level for action – increased to 94 from 38 in 2018; and
- Number of equipment downtime hours logged in response to noise management triggers – increased by ~ 11% from 2018.

A range of noise management projects and processes were undertaken during 2019. 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 2019 is presented in **Table 6.1**.

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

TABLE 6.1 SUMMARY OF SUPPLEMENTARY ATTENDED NOISE MONITORING CONDUCTED BY COMMUNITY RESPONSE OFFICERS 2019

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)	1072	41	13	33.4	32.9
Bulga Village	651	3	-	32.4	31.1
Inlet Road	671	27	1	33.4	32.4
Inlet Road West	407	-	-	30.1	27.7
Long Point	1133	5	-	31.1	30.6
South Bulga	0	-	-	-	-
Wambo Road	305	4	-	33.5	31.7
Total	4239	80	14	-	-

^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 exceeded the trigger, up to 1203 hours of equipment downtime were recorded to manage noise during 2019. This is an increase (approximately 11%) to the number of downtime hours recorded in 2018 coinciding with an increase in the number of supplementary noise measurements completed which exceed the trigger for management action.

6.2.2 Noise Performance

A total of 98 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 L_{Aeq}, 15 minute and L_{A1}, 1min noise criteria. Noise monitoring results are presented in the Monthly Environmental Monitoring Reports, available via the MTW website http://insite.yancoal.com.au.

In accordance with Fact Sheet C of the Noise Policy for Industry (NPfI), MTW has assessed measured noise levels collected during the attended compliance programme for low frequency content, and applied the modifying factor correction where applicable.

The application of the modifying factor resulted in one (1) exceedance of the WML L_{Aeq} Impact Assessment Criteria (refer to **Table 6.2)** during the reporting period on 17 January 2019 at 21:41 at Inlet Road**.** A subsequent measurement was taken at 22:40, on the same night. The re-measure confirmed compliance was achieved with the L_{Aeq},15minute criteria. Follow up monitoring was conducted on the night of 24 January 2019, which complied with the L_{Aeq},15minute criteria and no further action was required. As both the re-measure and follow up monitoring were compliant, the initial exceedance does not constitute a non-compliance, as per MTW's approved Noise Management Plan. DPIE were notified in writing of the exceedance on 18 January 2019, and the result of follow up monitoring on 25 January 2019.

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

Location	Date/Time	Relevant Criteria	Criterion (dB)*	L_{Aeq}(dB)	Revised L_{Aeq} (dB)	Exceeds by (dB)
Inlet Road	17/01/2019 21:41	WML L_{Aeq} impact assessment criteria	37	37	39	2

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 2019.

TABLE 6.3 COMPARISON OF 2019 NOISE MONITORING RESULTS AGAINST PREVIOUS YEARS'

Year	Number of assessments	Number of exceedances)	Number of non-compliances
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

Given the large dataset available, a comparison between the results collected through the supplementary noise monitoring regime from year to year is also considered valuable. The data shows increases in the number of assessments made, coinciding with an increase in the number of measurements exceeding the WML and MTO noise management triggers (shown in **Table 6.4** below) and a general increase in the average WML noise levels. This also coincided with up to an 11% increase in equipment stoppages due to noise delays.

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))*	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Wollemi Peak Road (Bulga RFS)	1075	1072	13	41	3	13	32.6	33.4	32.1	32.9
Bulga Village	609	651	1	3	-	-	31.8	32.4	30.9	31.1
Inlet Road	499	671	13	27	-	1	33.3	33.4	31.9	32.4
Inlet Road West	290	407	1	-	-	-	29.7	30.1	28.5	27.7
Long Point	1000	1133	1	5	-	-	30.1	31.1	30.9	30.6
South Bulga	0	0	-	-	-	-	-	-	-	-
Wambo Road	112	305	6	4	-	-	35.2	33.5	32.3	31.7
Total	3594	4239	35	80	3	14	-	-	-	-

^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 Comparison against EA Predictions

Table 6.5 provides a comparison of 2019 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 2019 data is the calculated quarterly average of WML contribution to measured LAeq (15 minute) results 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 lower than that predicted.

TABLE 6.5 PREDICTED NIGHT TIME WML (EIS 2014) LAEQ (15 MINUTE) NOISE LEVELS AND AVERAGED 2019 MONITORING RESULTS

Monitoring Location	Year 3 Modelled Noise	Quarter 1 2019 average	Quarter 2 2019 average	Quarter 3 2019 average	Quarter 4 2019 average
	$L_{Aeq\ (15\ minute)}$ (dB)	$L_{Aeq\ (15\ minute)}$ (dB)	$L_{Aeq\ (15\ minute)}$ (dB)	$L_{Aeq\ (15\ minute)}$ (dB)	$L_{Aeq\ (15\ minute)}$ (dB)
Wollemi Peak Road*/Bulga RFS	≤38	25.0	26.3	28.0	25.0
Bulga Village	≤38	28	26.7	28.7	25.0
Gouldsville Road	≤35	28.3	26.7	28.0	28.3
Inlet Road	≤37	31.5	27.3	29.0	27.7
Inlet Road West*	≤35	25.0	25.0	26.7	27.0
Long Point*	≤35	26.0	25.0	25.0	25.0
South Bulga	≤38	25.0	25.0	25.0	25.0
Wambo Road	≤38	28.3	27.0	27.7	25.0

**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 2019 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.

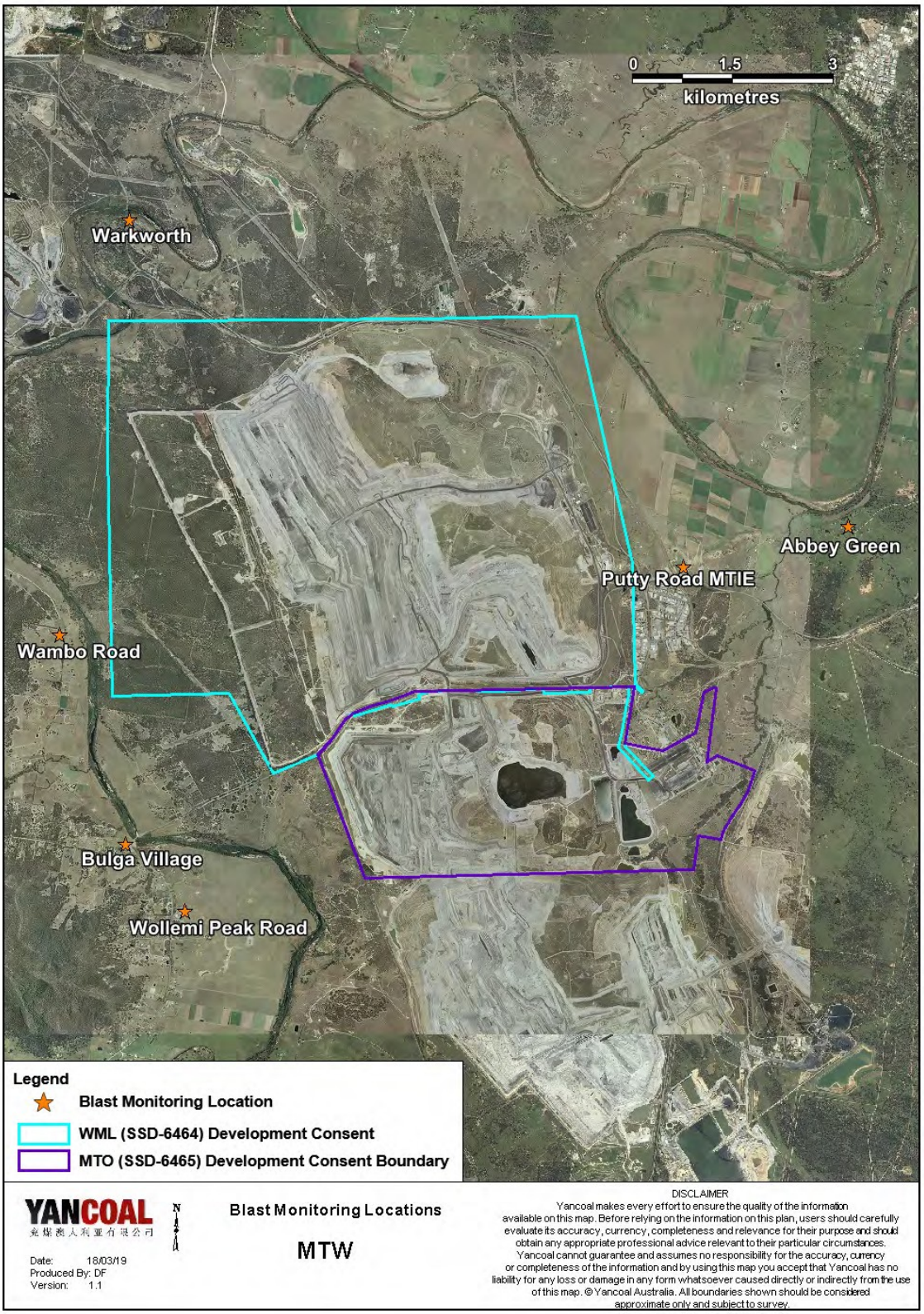


FIGURE 4: BLAST MONITORING LOCATIONS

6.3.2 Blast Performance

During the reporting period 250 blast events were initiated at MTW. One (**1**) blast event on **4 April 2019** recorded an air blast overpressure result of **121.2 dB(L),** exceeding the 120 dB(L) threshold for air blast overpressure at the Warkworth monitoring location.

A preliminary notification of the suspected airblast overpressure exceedance was reported to the DPIE and to the EPA on 5 April 2019. A written report was subsequently provided to DPIE and to the EPA for this blast which concluded that "The reason that the AOP level that resulted at the Warkworth monitoring station was greater than predicted was due to the fact that the actual meteorological data, and hence the actual effects of meteorology, were different from that predicted." WML received a penalty notice for the AOP exceedance incident, which was received in September 2019. The penalty notice was issued by DPIE for a non-compliance of the blasting limits of the Warkworth Development Consent (SSD 6464). Further details on this incident and the actions taken by MTW are provided in **Section 10.**

On 7 August 2019 a blast was detonated in the North Pit of the Warkworth Mine. The resulting blast dust travelled to the east over land associated with Warkworth Coal Mine, Putty Road, and the Mount Thorley Industrial Estate before dissipating over farmland east of the licenced premises. Further details on this incident and the actions taken by MTW are provided in **Section 10.**

During the reporting period 16 blast events were initiated at MTO. Of the 16 blasts, a single blast vibration result at the Wollemi Peak Road monitor on 10 December 2019 was recorded in the range of 5-10mm/s (actual result 5.67mm/s). Due to the small number of blasts at MTO, this has resulted in 6.3% of blasts at the Wollemi Peak Road monitoring location being in the range of 5-10mm/s, which is greater than the requirements of development consent SSD-6465 which permits up to 5% of blasts to record in the range of 5-10mm/s in a 12 month period.

The non-compliance was reported to DPIE and to the EPA (via the MTO Annual Return). An investigation undertaken into the 10 December 2019 vibration result identified that ground conditions related to drought conditions and a presplit shot fired shortly after the main production shot, may have both contributed to a higher than predicted result. Further details on this incident and the actions taken by MTW are provided in **Section 10.**

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

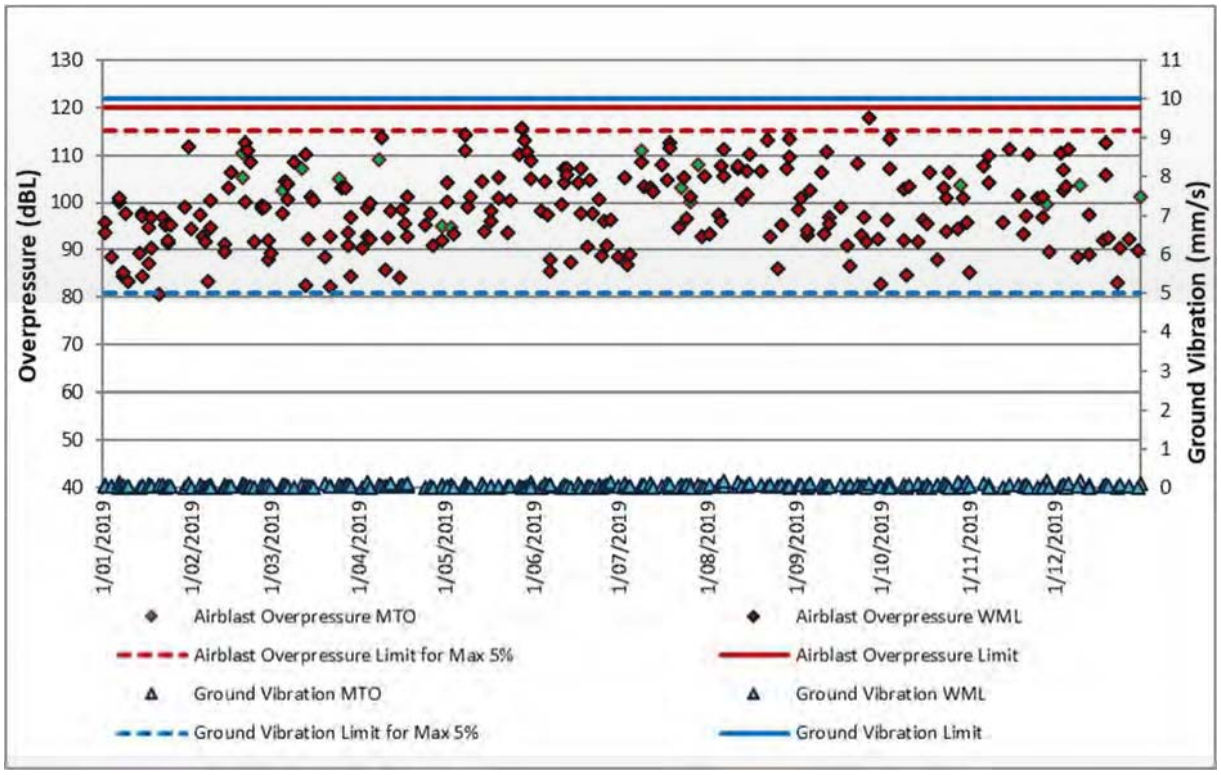


FIGURE 5: ABBEY GREEN BLAST RESULTS

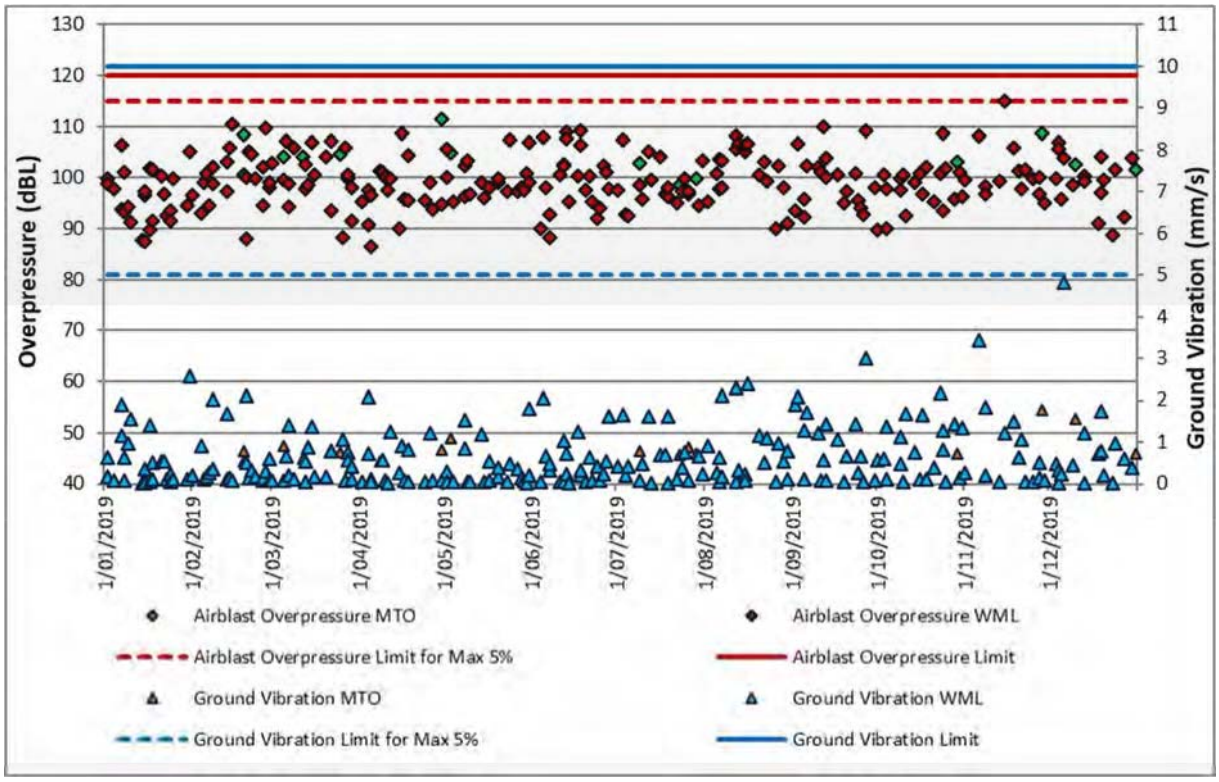


FIGURE 6: BULGA VILLAGE BLAST RESULTS

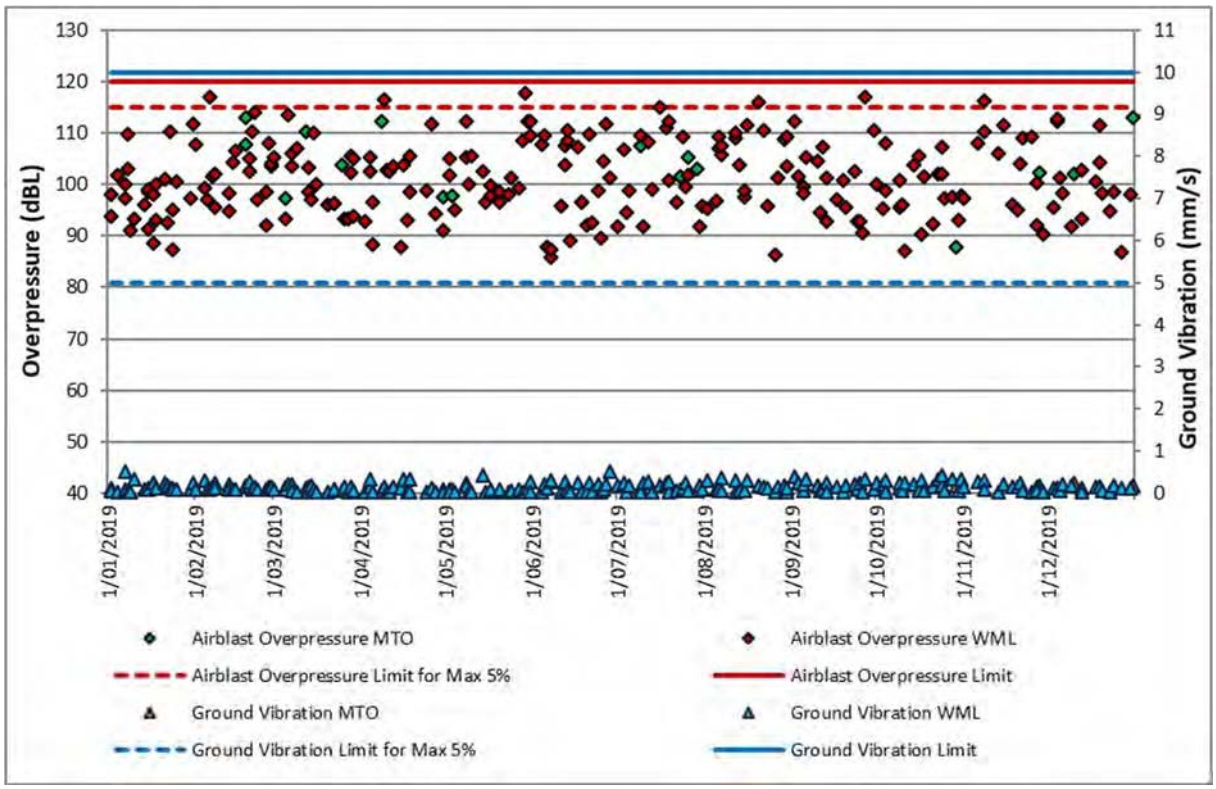


FIGURE 7: MTIE BLAST RESULTS

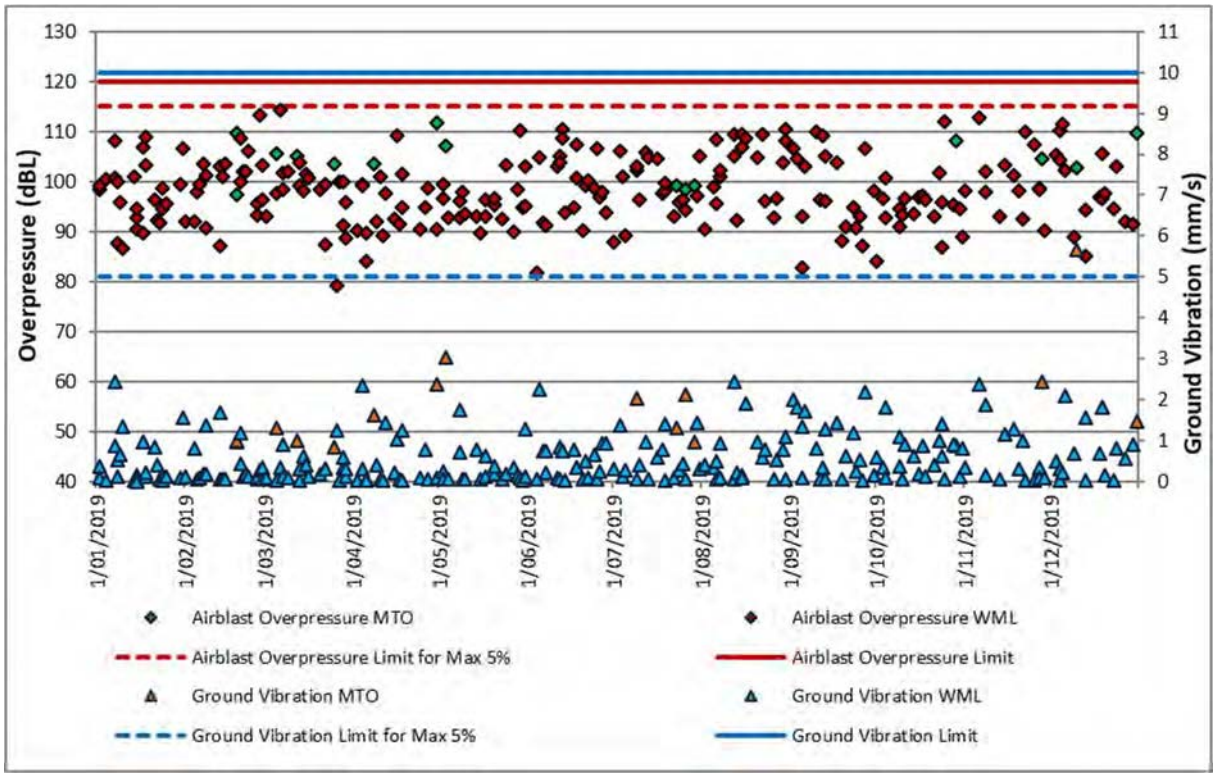


FIGURE 8: WOLLEMI PEAK ROAD BULGA BLAST RESULTS

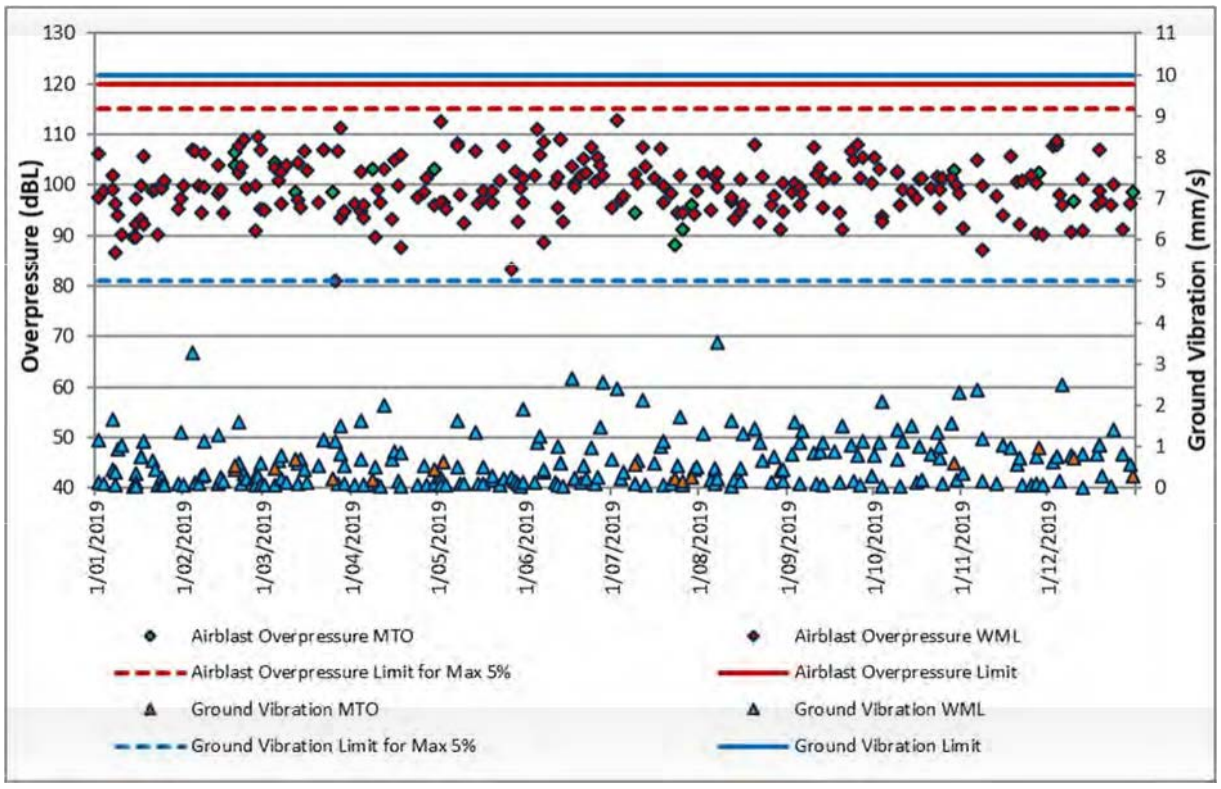


FIGURE 9: WAMBO ROAD BLAST RESULTS

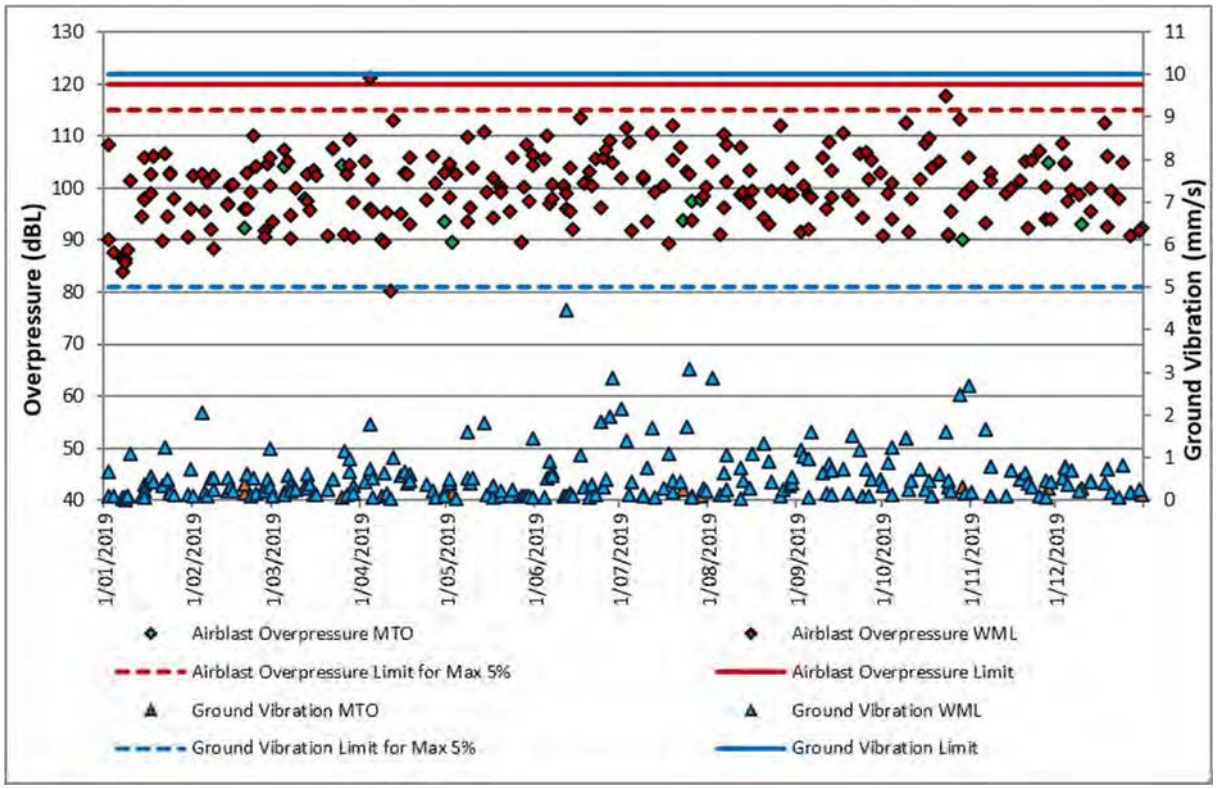


FIGURE 10: WARKWORTH BLAST RESULTS

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 2019, no blasts produced visible post-blast fume with a post-blast ranking Level 4 or higher according to the AEISG Scale.

Rankings for visible blast fume according to the AEISG scale for shots fired during 2019 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	2019	2018	2017
0	269	280	329
1	16	26	31
2	7	15	25
3	1	2	2
4	0	0	1
5	0	0	0
Total*	293	323	378

** 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 2019 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.

4,478 real-time alarms for air quality and wind conditions were received and acknowledged during 2019. In response, **6,762** 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**.

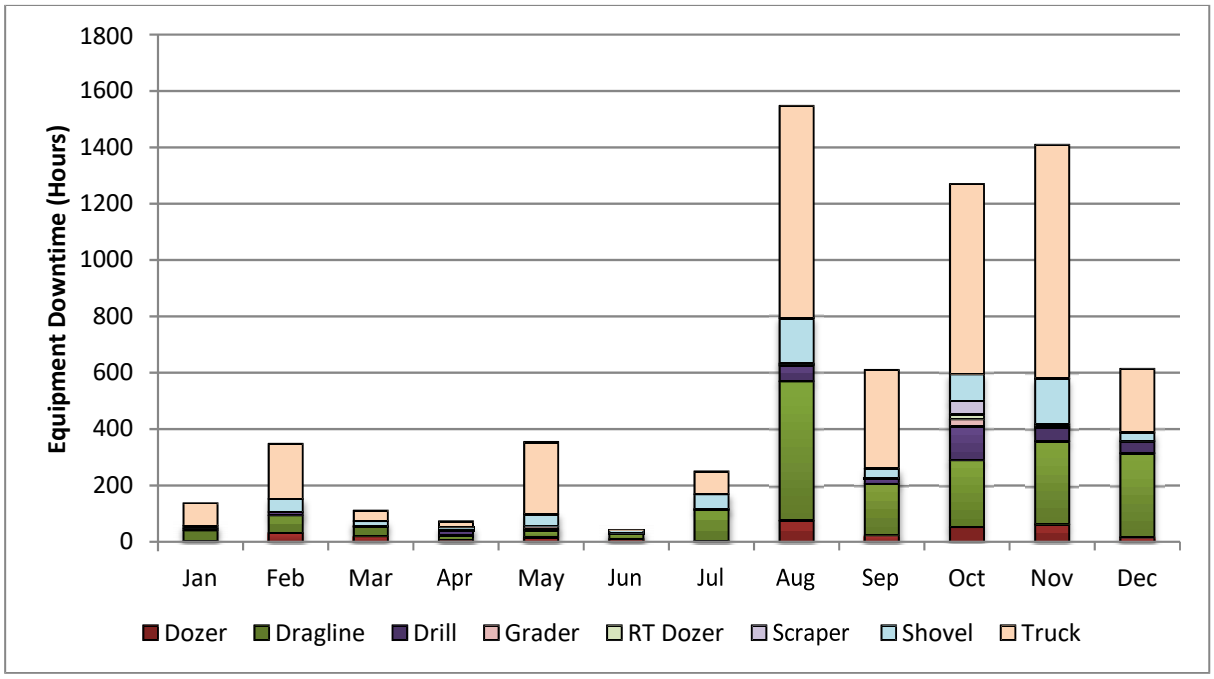


FIGURE 11: EQUIPMENT DOWNTIME FOR DUST MANAGEMENT BY MONTH (2019)

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 2019, 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

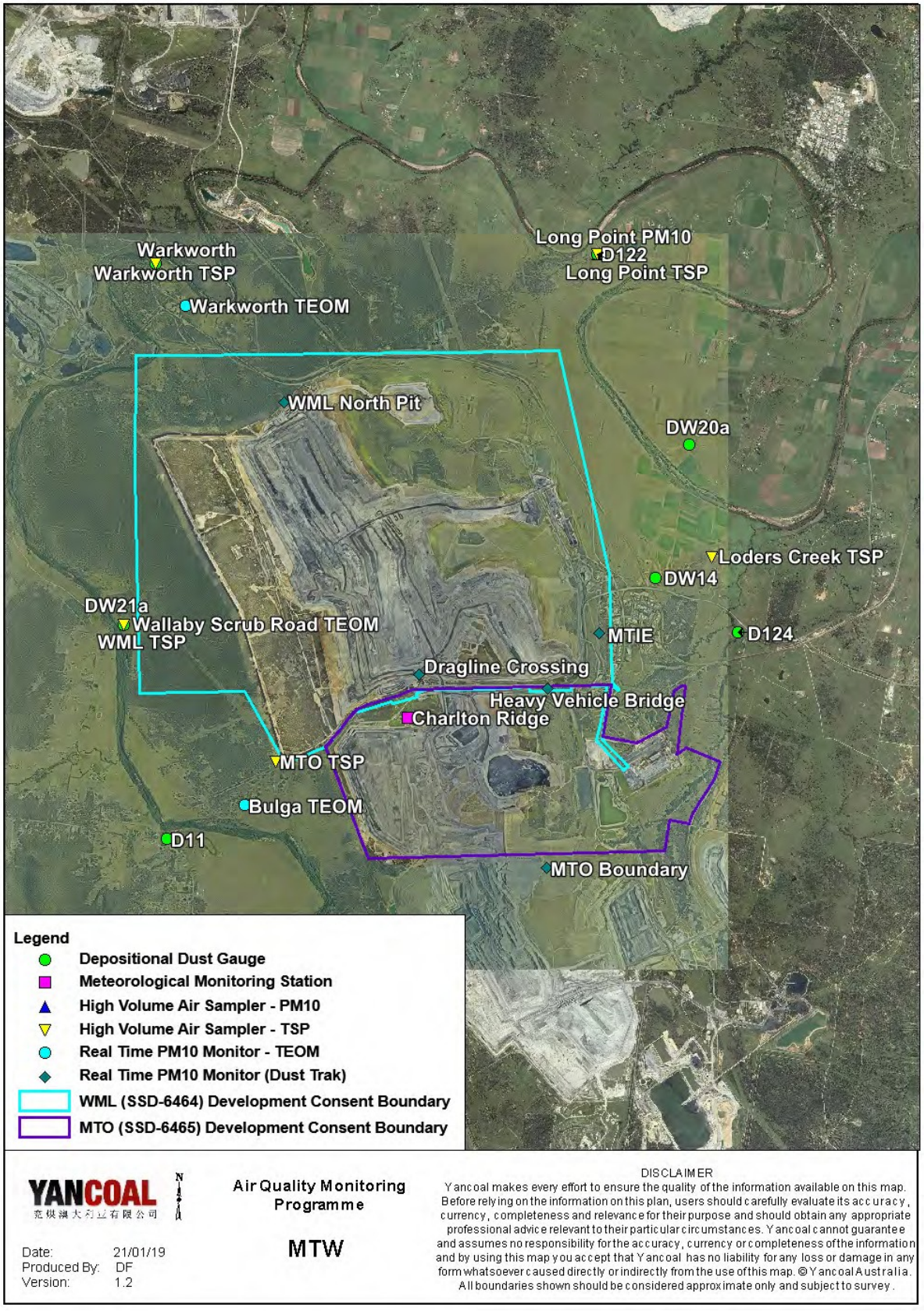


FIGURE 12: AIR AND METEOROLOGICAL MONITORING LOCATIONS MTW 2019

TABLE 6.7 AIR QUALITY IMPACT ASSESSMENT CRITERIA AND 2019 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 2019 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 1.9g/m2/month, or 35% of the total level of 5.3g/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 2019, 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 increased Depositional Dust in 2019 compared to 2018. This is consistent with well below average rainfall totals recorded in 2017 (444 mm), 2018 (457 mm) and 2019 (304 mm).

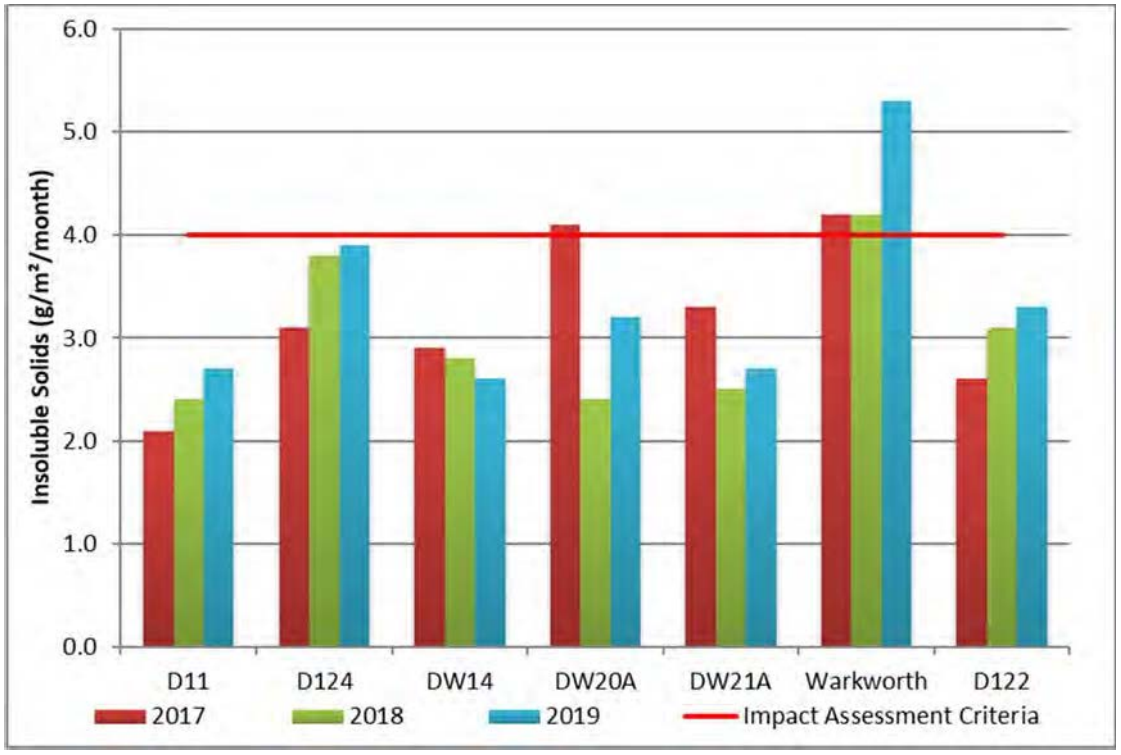


FIGURE 13: 2019 DEPOSITIONAL DUST RESULTS COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA AND PREVIOUS YEARS' RESULTS

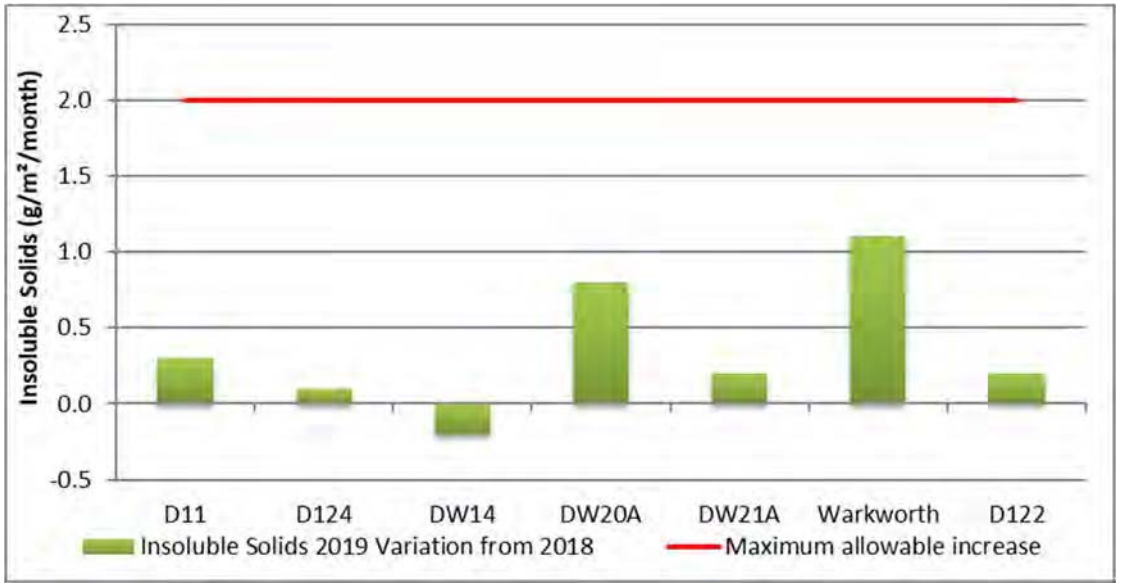


FIGURE 14: VARIATION IN INSOLUBLE SOLIDS DEPOSITION RATE FROM 2018 TO 2019 COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA

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 2019 compared against the long-term impact assessment criterion and previous years' data, are shown **Figure 15**.

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

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

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

TABLE 6.8 ANNUAL TSP INVESTIGATION - 2019

Date	Site	Annual Average PM_{10} result ($\mu g/m^3$)	Calculated Annual TSP ($\mu g/m3$)	Discussion
2019	Warkworth HVAS TSP	98.6	19.9*	An external consultant was engaged to investigate the exceedance. The investigation determined that contribution from MTW at the Warkworth monitor during the review period was relatively low. This was based on an analysis of meteorological data and position of the site in relation to MTW. As the measured result is not primarily attributable to MTW, it does not constitute non-compliance, as per MTW's approved Air Quality Management Plan. No further action is required.

* *MTW's estimated contribution to annual average TSP level ($\mu g/m^3$), excluding "extraordinary event" days.*

During the reporting period, one (1) out of the 305 TSP measurements was not able to be collected on the scheduled sampling date (based on a sampling frequency of every six days) due to a power failure.

The annual average TSP concentrations recorded in 2019 are generally higher than those recorded in previous years, which is likely related to well below average rainfall for the year.

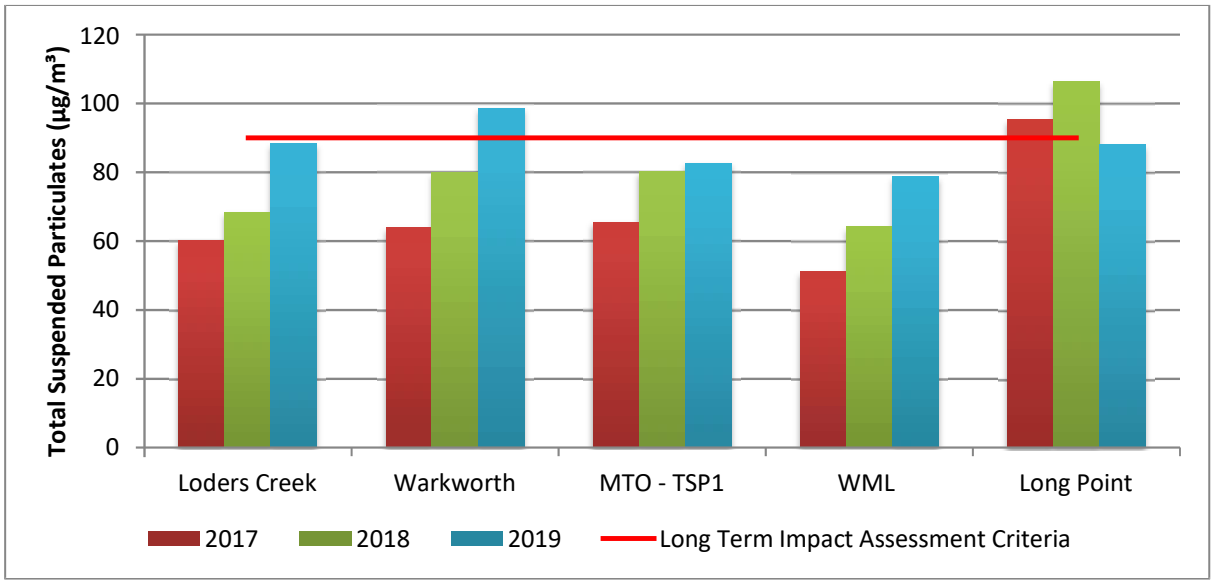


FIGURE 15: 2019 TSP ANNUAL AVERAGE COMPARED AGAINST THE IMPACT ASSESSMENT CRITERIA AND PREVIOUS YEARS' RESULTS

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 2019, 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 for an extended period from approximately late October 2019 until the end of the year. The elevated levels were primarily caused by smoke from bushfires which impacted the east coast of NSW at the end of 2019, as well as dust storms and 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 the Upper Hunter in 2019, 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.

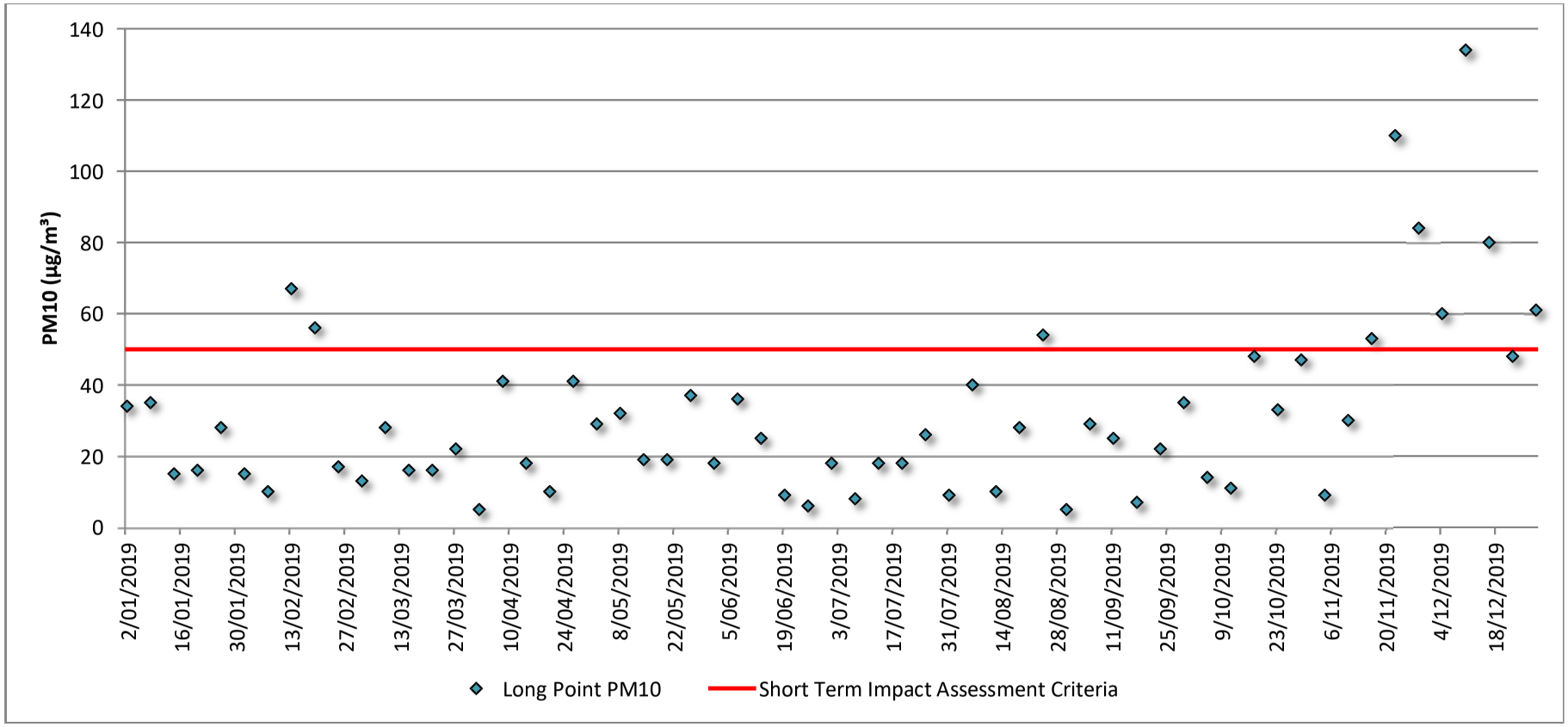


FIGURE 16: PM10 24HR MONITORING RESULTS (MEASURED BY MTW PM10 HVAS NETWORK)

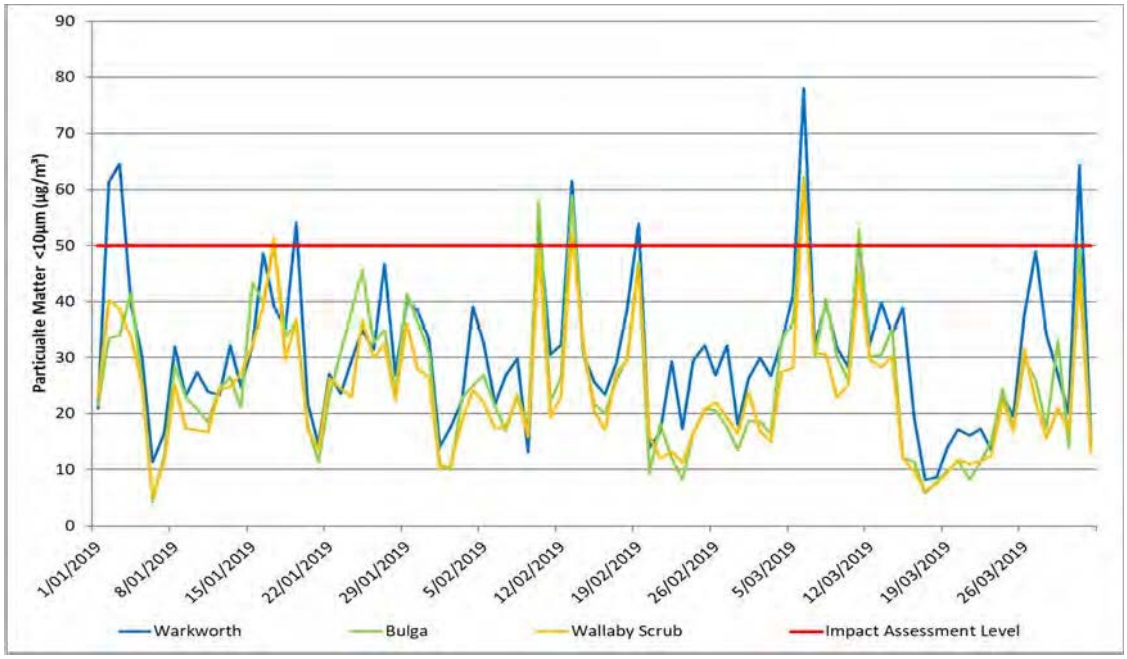


FIGURE 17: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER ONE 2019

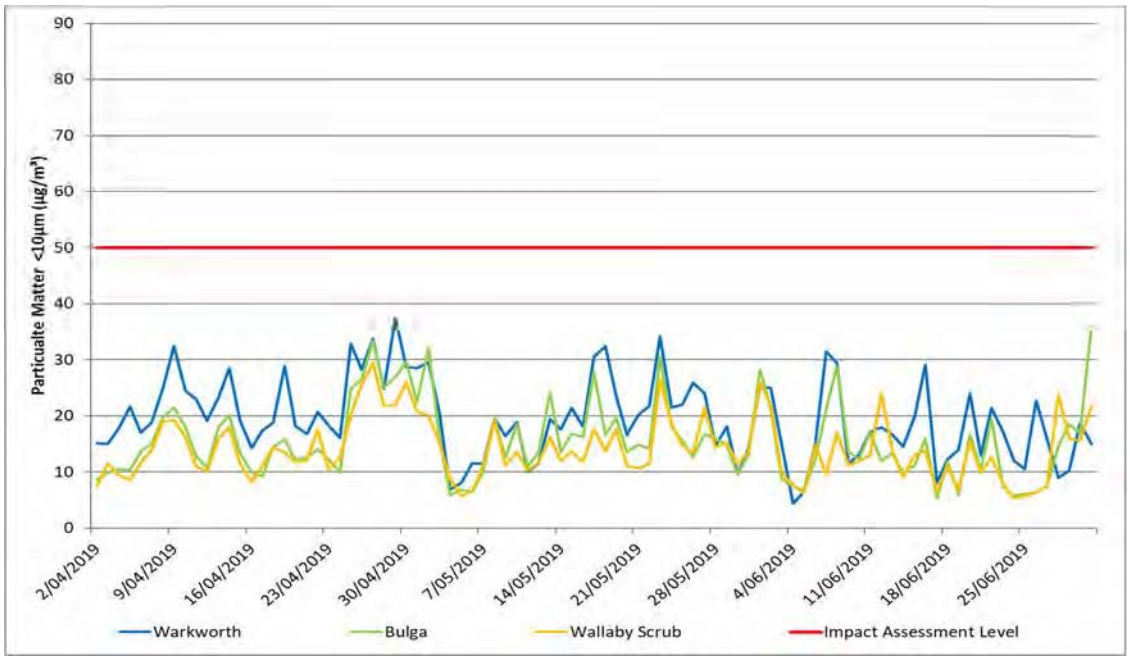


FIGURE 18: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER TWO 2019

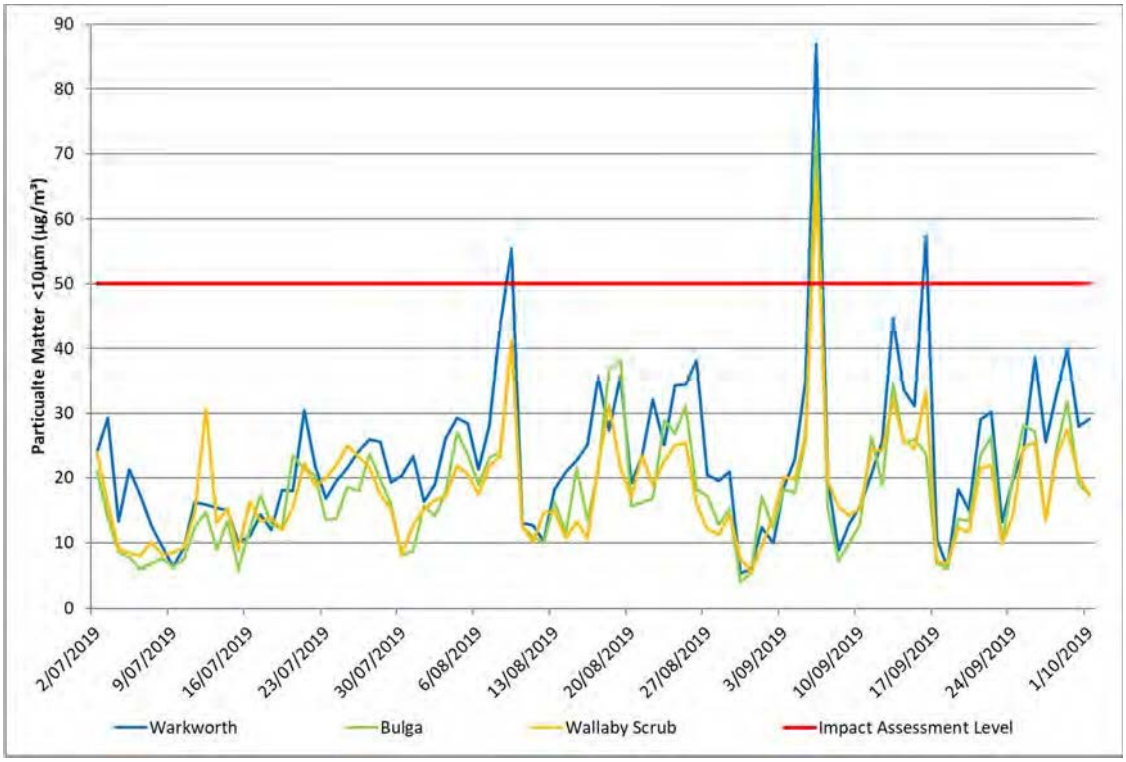


FIGURE 19: 24HR AVERAGE PM10 MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER THREE 2019

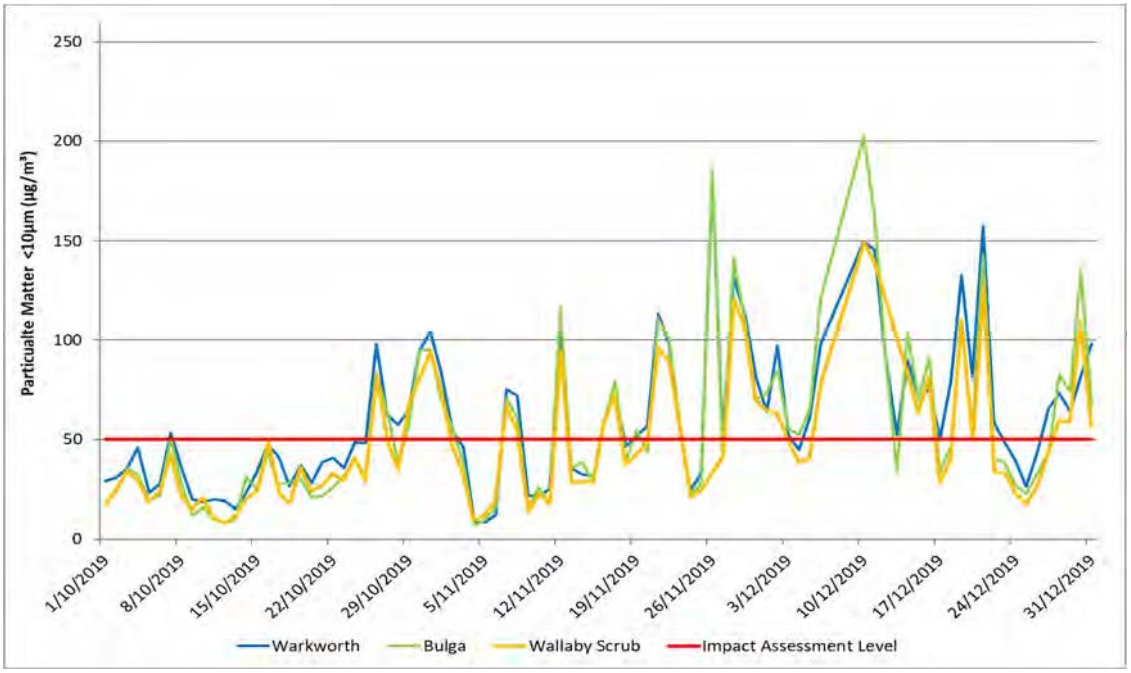


FIGURE 20: 24HR AVERAGE PM_{10} MEASURED AT TEOM MONITORS SURROUNDING MTW - QUARTER FOUR 2019

TABLE 6.9 EXTRAORDINARY EVENT DAYS

Month	Day(s)
Jan	16, 17
Feb	13, 19
Mar	6, 31
Apr	26
May	-
Jun	-
Jul	-
Aug	8, 9
Sep	6
Oct	7, 8, 18, 19, 24, 25, 26, 27, 28, 30, 31
Nov	1, 2, 7, 8, 12, 16, 17, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30
Dec	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, 30, 31

Excluding "extraordinary event" days, one high volume air sample and 10 TEOM PM_{10} measurement results potentially exceeded the 24 hour short term impact assessment criteria during the reporting period. All 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 as not a significant contributor to these 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 6.10 24 HOUR PM_{10} INVESTIGATIONS - 2019

Date	Site	24hr PM_{10} result ($\mu g/m^3$)	Estimated contribution from MTW ($\mu g/m^3$)	Discussion
02/01/2019	Warkworth TEOM	61.4	32.5	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 32.5µg/m3 or ~53% 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
03/01/2019	Warkworth TEOM	64.5	33.3	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 33.3µg/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.
19/01/2019	Warkworth TEOM	54.1	20.3	An analysis of meteorological data and background PM10 levels has determined the maximum potential MTW contribution to the result to be in the order of 20.3µg/m3 or ~38% 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.
10/02/2019	Warkworth TEOM	53.9	23.4	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 23.4µg/m3 or ~43% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
10/02/2019	Bulga TEOM	58.0	22.2	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 22.2µg/m3 or ~38% 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
11/03/2019	Warkworth TEOM	51.2	35.3	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 35.3µg/m3 or ~69% 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.
11/03/2019	Bulga TEOM	53.1	15.8	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 15.8µg/m3 or ~30% of the measured result. As the calculated contribution was less than 75% of the measured result, MTW operations are not considered to be a significant contributor to the result, as described in the MTW Air Quality Management Plan.
24/08/2019	Long Point HVAS PM_{10}	54.0	-	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 25µg/m3 or ~47% 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.
29/10/2019	Warkworth TEOM	64.7	38.4	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 38.4µg/m3 or ~60% 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
29/10/2019	Bulga TEOM	56.8	27.8	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 27.8µg/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.
29/10/2019	Wallaby Scrub Road TEOM	68.3	26.4	An analysis of meteorological data has determined the maximum potential MTW contribution to the result to be in the order of 26.4µg/m3 or ~39% 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 increases in annual average PM_{10} concentrations compared to 2018. This increase is considered largely attributable to bushfires (which impacted the east coast of NSW at the end of 2019), regional dust events and well below average rainfall.

The Long Point monitoring location recorded a decrease in annual average PM_{10} concentrations compared to 2018. This is considered to be related to the relocation of horses from the immediately adjacent paddock.

One high volume air sampler and one TEOM recorded a result above the annual PM_{10} impact assessment criteria during the reporting period. The results were investigated by an external consultant following identification of the exceedances to determine the levels of contribution from MTW activities in accordance with the compliance protocol outlined in the MTW Air Quality Management Plan. The results were determined to be compliant with the relevant criteria. A summary of the investigations undertaken are provided in **Table 6.11**.

TABLE 6.11 ANNUAL PM_{10} INVESTIGATION - 2019

Date	Site	Annual Average PM_{10} result ($\mu g/m^3$)	Calculated Annual PM_{10} ($\mu g/m^3$)	Discussion
2019	Long Point HVAS PM_{10}	31.3	1.8*	An external consultant was engaged to investigate the exceedance. The investigation determined that contribution from MTW at the Long Point monitor during the review period was relatively low. This was based on an analysis of meteorological data and position of the site in relation to MTW. As the measured result is not primarily attributable to MTW, it does not constitute non-compliance, as per MTW's approved Air Quality Management Plan and so no further action is required.
2019	Warkworth OEH TEOM	34.1	3.8*	An external consultant was engaged to investigate the exceedance. The investigation determined that contribution from MTW at the Warkworth OEH monitor during the review period was relatively low. This was based on an analysis of meteorological data and position of the site in relation to MTW. As the measured result is not primarily attributable to MTW, it does not constitute non-compliance, as per MTW's approved Air Quality Management Plan and so no further action is required.

* *MTW's estimated contribution to annual average PM10 level ($\mu g/m^3$), excluding "extraordinary event" days.*

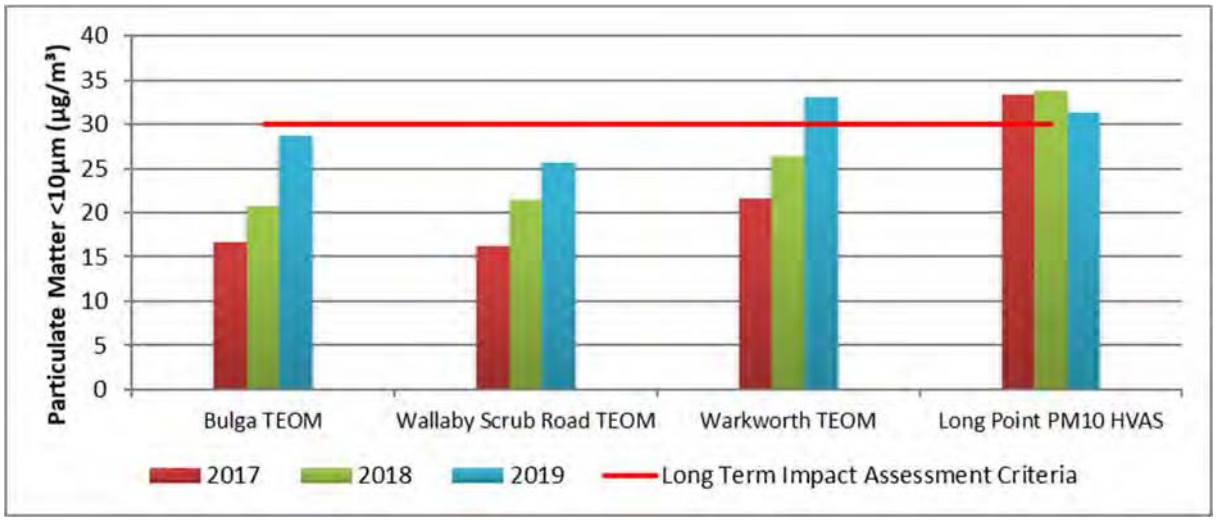


FIGURE 21: ANNUAL AVERAGE PM10 RESULTS 2017 TO 2019

6.4.2.7 Comparison of 2019 Air Quality data against EA predictions

Annual average PM_{10} results were 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. An analysis of 2019 meteorological and PM_{10} monitoring data was undertaken by an external consultant, which identified that the measured increases are largely related to elevated background levels and not primarily a direct result of MTW activity. 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 TSP contribution from regional particulate events such as bushfires, stock movement, dust from local roads and driveways and agricultural activity.

TABLE 6.12 2019 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)	2019 Annual Average (µg/m³)
Bulga OEH TEOM	23	28.7
Wallaby Scrub Road TEOM	16	25.6
Warkworth OEH TEOM	30	34.1
Long Point PM_{10}	16	31.3

TABLE 6.13 2019 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)	2019 Annual Average (µg/m^3)
MTO TSP1	52	82.6
Loders Creek TSP	43	88.4
WML- HV2a	39	78.7
Warkworth	65	98.6
Long Point	38	88.0

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 sites 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).

There was one additional Aboriginal cultural heritage site identified during the reporting period. The site was identified by a MTW employee as part of the due diligence process associated with the sites 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 ACHMP and the site was added to the MTW cultural heritage management GIS layer.

An AHMP compliance inspection covering the 2019 reporting period was undertaken on 2-3 March 2020. This inspection was conducted by representatives of the Aboriginal community, internal MTW personnel and a consultant archaeologist. A total of 57 Aboriginal cultural heritage sites were assessed 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 native title and community groups, corporations and individuals. There were no meetings of the CHWG during the reporting period. Meetings with the CHWG are 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 36 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 2019.

6.5.2.2 Historic Heritage

6.5.2.2.1 Historic Heritage Activities

No historic heritage surveys or investigations were required at MTW in 2019.

An Historic Heritage Management Plan (HHMP) compliance inspection covering the 2019 reporting period was conducted on 4 March 2020. This inspection was conducted by a consultant archaeologist, assisted by representatives of the Community Heritage Advisory Group 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, with four applications received. Singleton Council advise in their 2019 annual HHCF report, that Council in consultation their consultant Heritage Advisor reviewed the four applications with a recommendation put to the Singleton Heritage Advisory Council (SHAC) to fund one application. However, due to staff changes at Singleton Council, no applications were funded during 2019, and no further funding was advertised during 2019. MTW has consulted with Council during February 2020 on how the HHCF processes will be progressed 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 2019.

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 roads, particularly nearby residents in Bulga Village, Mount Thorley, Warkworth Village, Long Point, Milbrodale and vehicular traffic on the Putty Road and Golden Highway.

Actions undertaken in 2019 to manage lighting impacts at MTW included:

- Routine night shift inspections conducted by Community Response Officers to observe operating practices and to ensure lights are not shining towards nearby residential areas or affecting public roads;
- Yellow lights are used in preference to white lights in areas based on risk and external exposure;
- Alternate sheltered dumps are operated or work areas are shut down if lighting or visual amenity issues arise and cannot be sufficiently managed.

6.6.2.2 Visual Screening

Visual screening of MTW operations uses 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 was extended to the west, to the junction of the Sealed Geo Road (former Wallaby Scrub Road), during 2019. Vegetation screening has also been planted during 2019 to the West of the former Wallaby Scrub Road to improve visual amenity for passing motorists. A section of deceased trees along the South Pit of Warkworth adjacent to the Putty Road were also removed in 2019 to improve visual amenity, with infill planting to occur in 2020 in this area.

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 2019 have focused on mitigating the risk of unauthorised water releases from site. In addition to the existing management measures undertaken on site MTW commissioned a remote boundary dam monitoring system during the reporting period. The system was installed in December 2019 at Dams 46N, 43N, 51N, 52N, 53N and 50N. The new system allows for real time dam level information and photography to be captured at each location in real time. All information is captured is uploaded to a website repository that can be accessed by site personnel to assist with improving visibility and management at these locations. MTW will be monitoring the effectiveness of the new system in the next reporting period.

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 was one reportable water related incident during the reporting period. The incident involved the discharge of water from Dam 46N and Dam 53N as a result of a significant rain event on 30 March 2019. MTW reported the incident to the relevant authorities at the time and submitted incident reports in accordance with the site Development Consent and Environmental Protection Licence. Following an investigation by both the EPA and DPIE MTW was issued with a Penalty Notice for the discharge from Dam 46N and an Official Caution for the discharge from Dam 53N. Further details on this incident and the corrective actions taken by MTW to prevent a recurrence are provided in **Section 10**.

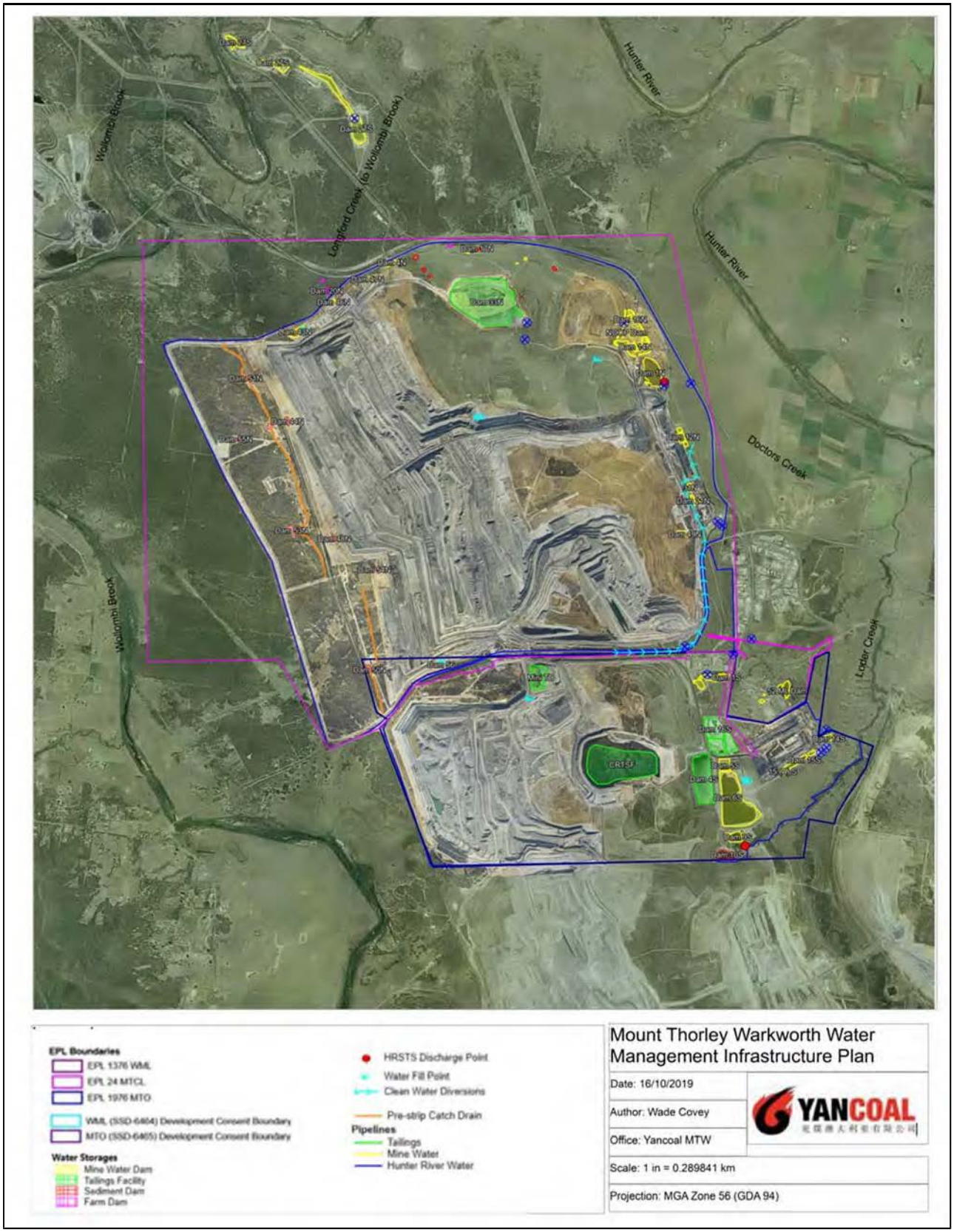


FIGURE 22: WATER MANAGEMENT INFRASTRUCTURE PLAN

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 2019 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 6.14 STATIC MODEL RESULTS, ANNUAL WATER BALANCE

Water Stream	Volume (ML) (% Total)
Inputs	
Rainfall Runoff	2,974 (39%)
Hunter River (MTJV supply scheme)	1,594 (21%)
Potable (Singleton Shire Council / trucked)	20 (<1%)
Groundwater	285 (4%)
Recycled to CHPP from tailings (not included in total)	6,536
Imported (LUG bore)	1731 (22%)
Imported (Hunter Valley Operations)	0 (0%)
Water from ROM Coal	1,024 (13%)
Total Inputs	**7,628**
Outputs	
Dust Suppression	3,325 (39%)
Evaporation – mine water dams	1,158 (14%)
Entrained in process waste	2,098 (25%)
Sharing with other mines	0 (0%)
Discharged (HRSTS)	0 (0%)
Water in coarse reject	685 (8%)
Water in product coal	1,105 (13%)
Miscellaneous use (wash-down etc.)	110 (1%)
Total Outputs	**8,481**
Change in storage	**(853)**

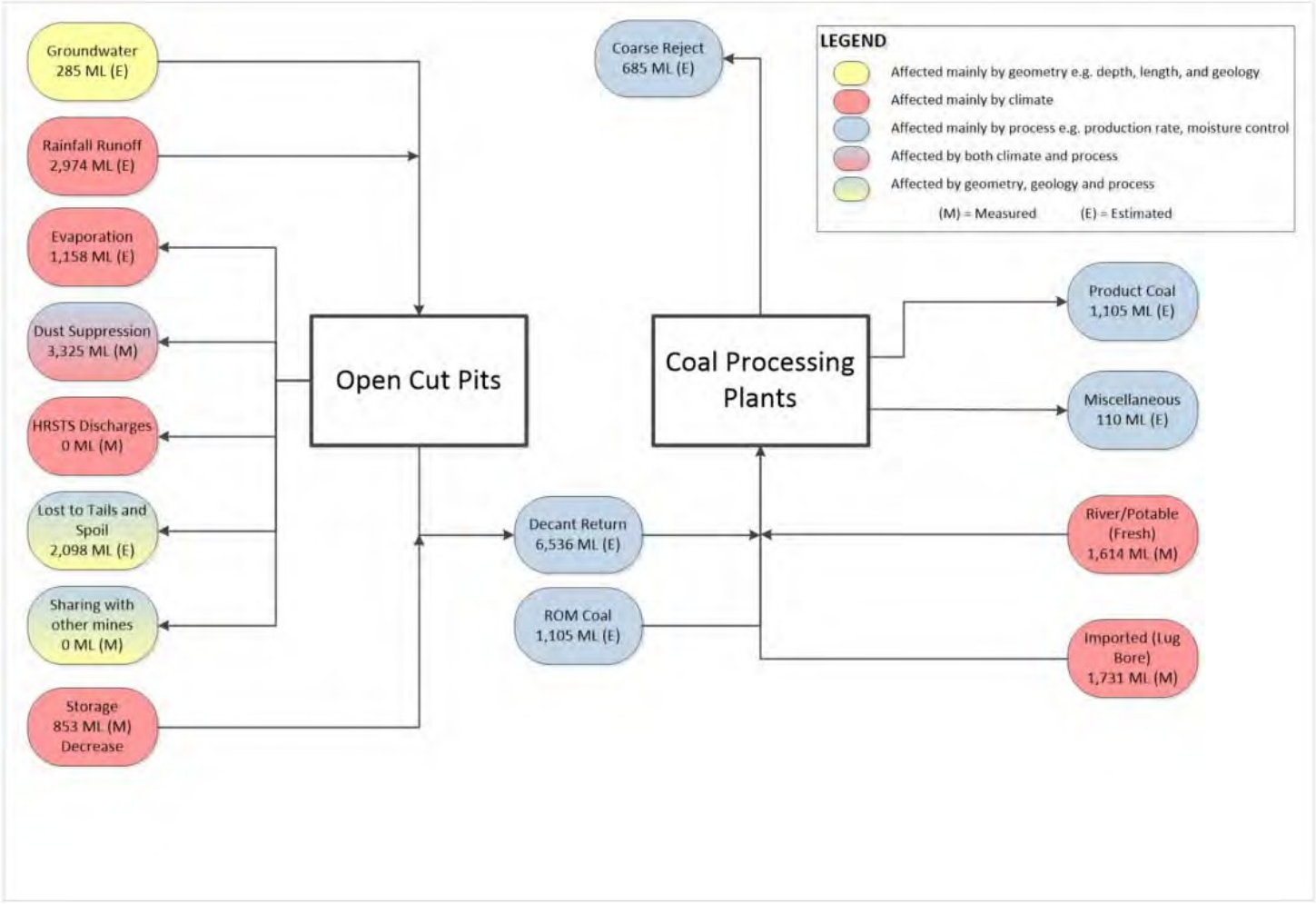


FIGURE 23: SCHEMATIC DIAGRAM MTW WATER FLUX

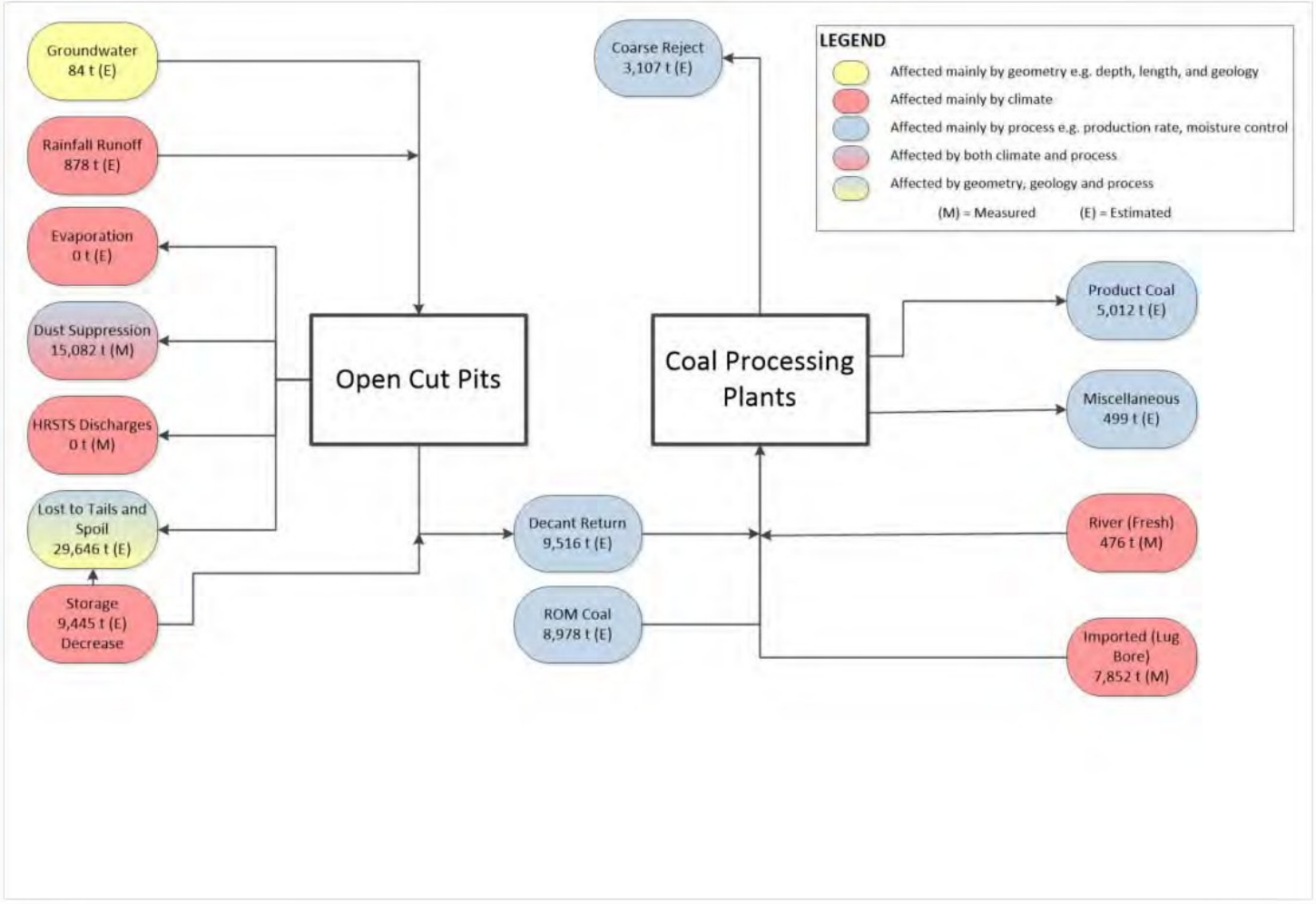


FIGURE 24: SCHEMATIC DIAGRAM MTW SALT FLUX

6.7.2.1 Water Inputs

A total of 303.8mm of rainfall was recorded at MTW in 2019 producing a calculated 2,974 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 2019 and comparable to the estimated runoff captured in the 2018 reporting period (3,698 ML) where the site recorded annual rainfall of 456.2mm.

As the site water inventory is drawn down, water is imported to meet site demand. During the reporting period 1,731 ML was imported from the LUG bore by MTW. This volume was an increase on the previous reporting period (875ML extracted), due to reliability improvements to the LUG infrastructure completed in 2019.

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 2019 AER reporting period, however, water was abstracted in the 2018 reporting period. A total of 1,594 ML of water was abstracted from the Hunter River during the reporting period for MTW operations.

Abstraction of 1,594 ML of water from the Hunter River in 2019 was slightly lower than the volume of water extracted in the previous reporting period. (1,768 ML extracted in 2018). Similar rainfall trends during this reporting period compared to the previous reporting period, indicate that rain events did not overcome the surface saturation threshold to generate runoff to replenish the site's water inventory.

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 2019 were for dust suppression on haul roads, mining areas and coal stockpiles (3,325ML), evaporation from Dams (1,158ML) and water entrained in process waste (2,098ML). Water usage for dust suppression on haul roads slightly increased compared to the 2018 reporting period which may be attributed to dry climatic conditions during the reporting period and increased utilisation of contractor water carts for ancillary mining areas.

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 2019 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.

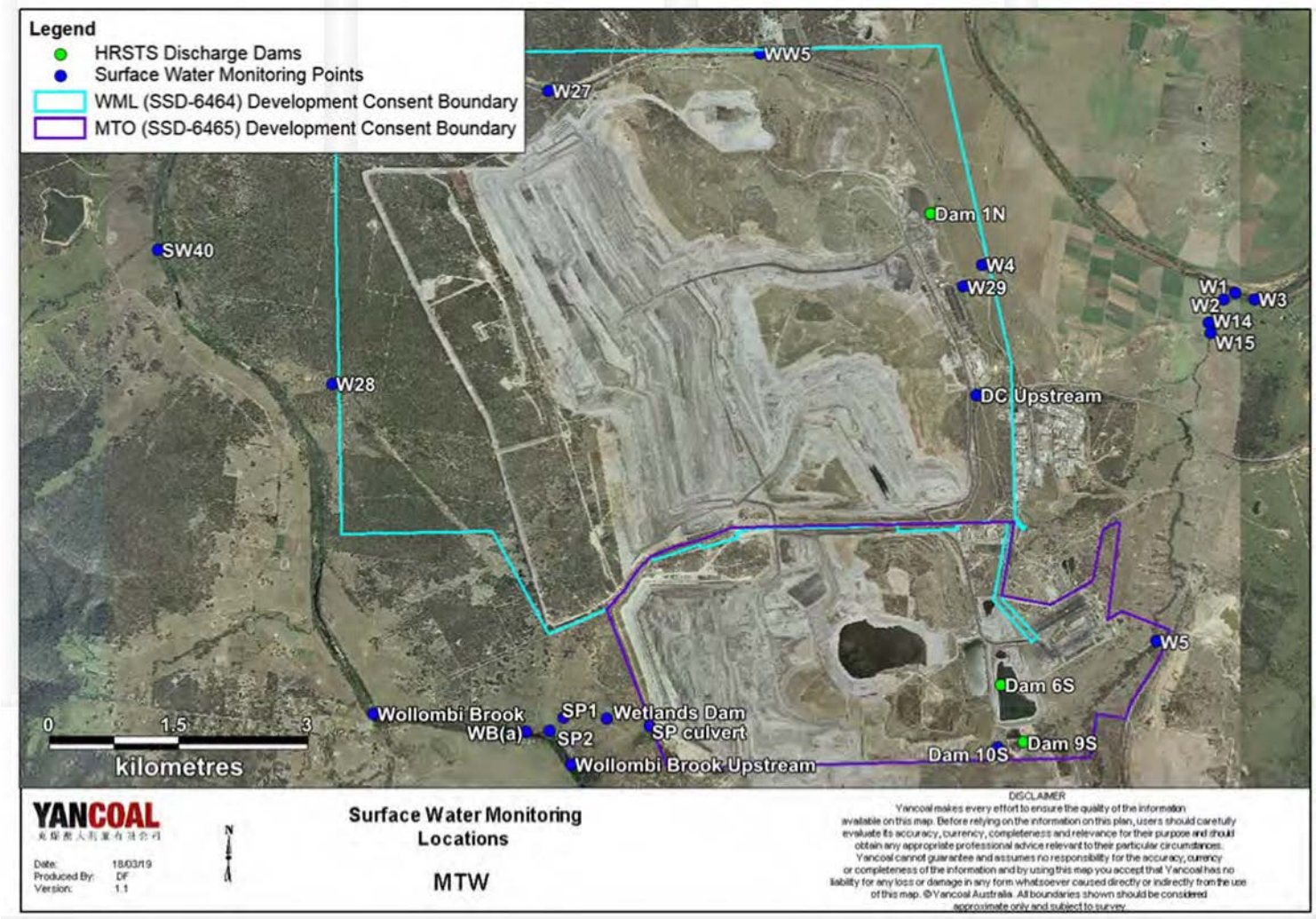


FIGURE 25: SURFACE WATER MONITORING POINTS

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 well below average rainfall during the reporting period, only two rain event sampling runs were completed in 2019. Low annual rainfall also resulted in lower data recovery in 2019 as multiple sites were recorded as dry during the monitoring events on multiple occasions. All required sampling and analysis was undertaken, except as detailed in **Table 6.15**. Trigger tracking results are described in **Table 6.16**.

TABLE 6.15 MTW WATER MONITORING DATA RECOVERY FOR 2019 (BY EXCEPTION)

Location	Data Recovery (%)	Comment
SP1	0%	Site recorded as dry in March
SP2	0%	Site recorded as dry in March
SP Culvert	50%	Site recorded as dry following first rain event in March
W14	50%	Site recorded as dry following first rain event in March
DC Upstream	50%	Site recorded as dry in March
W28	50%	Site recorded as dry following first rain event in March
Wetlands Dam	50%	Site recorded as dry following first rain event in March
W5	42%	Insufficient water for sampling from June to December
WW5	25%	Insufficient water for sampling in March, June and December
SW40	75%	Insufficient water for sampling in December
Dam 6S	92%	Insufficient water for sampling in July

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 Insite 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 and pH were generally stable during the reporting period across the majority of sites and consistent with historical seasonal trends. Elevated EC levels were recorded at the Wollombi Brook and Wollombi Brook Upstream monitoring

sites during the reporting period. It is expected that the readings were a result of the prolonged dry climatic conditions with minimal flow recorded within Wollombi Brook during the reporting period 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 an investigation into the elevated TSS readings at W5 (Loder Creek) during the reporting period. The investigation concluded that the elevated results were most likely attributed to the sampling methodology at this location as samples were taken from a shallow pooled section on the creek bed. This sampling location was moved slightly downstream of this location to avoid this issue. Trigger tracking results are provided where three consecutive measurements of EC or pH are recorded. These are also provided in the Monthly reports provided on the MTW Insite website (https://insite.yancoal.com.au/).

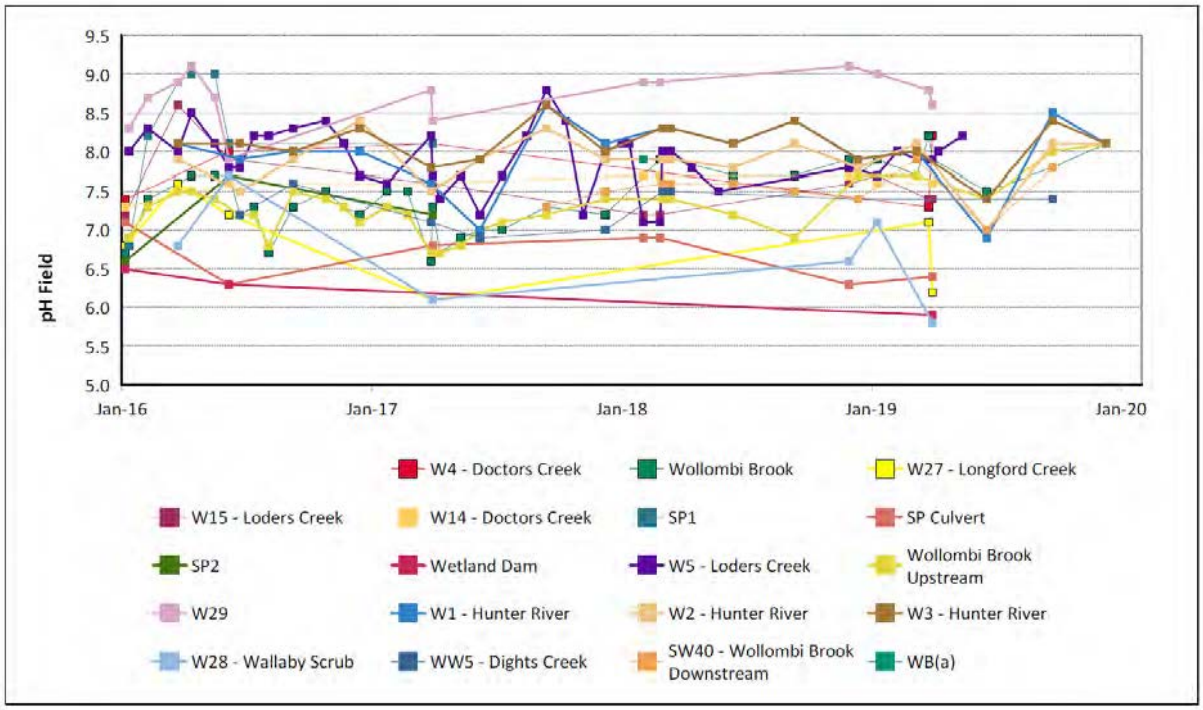
TABLE 6.16 SURFACE WATER MONITORING - TRIGGER TRACKING RESULTS

Site	Date	Trigger Limit	Action Taken in Response
W27	26/03/2019	EC –95th Percentile	Watching Brief* Note: Subsequent monitoring events have confirmed results are back within trigger limits. No further action required.
Wollombi Brook	08/03/2019	EC –95th Percentile	Watching Brief* Note: Elevated EC is considered attributable to prolonged dry climatic conditions, and not related to mining related impacts. Wollombi Brook Upstream showing similar EC results and trends. Continue to watch and monitor.
Wollombi Brook	19/06/2019	EC –95th Percentile	Watching Brief* Note: Elevated EC is considered attributable to prolonged dry climatic conditions, and not related to mining related impacts. Wollombi Brook Upstream showing similar EC results and trends. Continue to watch and monitor.
Wollombi Brook	23/09/2019	EC –95th Percentile	Watching Brief* Note: Elevated EC is considered attributable to prolonged dry climatic conditions, and not related to mining related impacts. Wollombi Brook Upstream showing similar EC results and trends. Continue to watch and monitor. Investigation commenced.
Wollombi Brook	10/12/2019	EC –95th Percentile	Investigation Undertaken. Elevated EC is considered attributable to prolonged dry climatic conditions, and not related to mining related impacts. Wollombi Brook Upstream showing similar EC results and trends. Continue to watch and monitor.
Wollombi Brook Upstream	08/03/2019	EC –95th Percentile	Watching Brief*

Site	Date	Trigger Limit	Action Taken in Response
Wollombi Brook Upstream	19/06/2019	EC –95th Percentile	Watching Brief* Note: Elevated EC is considered attributable to prolonged dry climatic conditions, and not related to mining related impacts. Continue to watch and monitor.
Wollombi Brook Upstream	23/09/2019	EC –95th Percentile	Watching Brief* Elevated EC is considered attributable to prolonged dry climatic conditions, and not related to mining related impacts. Wollombi Brook showing similar EC results and trends. Investigation commenced.
Wollombi Brook Upstream	10/12/2019	EC –95th Percentile	Investigation Undertaken. Elevated EC is considered attributable to prolonged dry climatic conditions, and not related to mining related impacts. Wollombi Brook showing similar EC results and trends. Continue to watch and monitor.
SW40	08/03/2019	EC –95th Percentile	Watching Brief*
SW40	19/06/2019	EC –95th Percentile	Watching Brief* Note: Elevated EC is considered attributable to prolonged dry climatic conditions, and not related to mining related impacts. Wollombi Brook U/S showing similar EC results and trends. Results from subsequent monitoring events have confirmed results are back within trigger limits.
W1	19/06/2019	pH –5th Percentile	Watching Brief*
W2	19/06/2019	pH –5th Percentile	Watching Brief*
W3	19/06/2019	pH –5th Percentile	Watching Brief*
W4	26/03/2019	pH –5th Percentile	Watching Brief*
W27	31/03/2019	pH –5th Percentile	Watching Brief*
W28	31/03/2019	pH –5th Percentile	Watching Brief*
W1	19/06/2019	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Note: Unlikely to be associated with MTW mining related impacts.
W1	23/09/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS considered associated with recent rainfall and increased flow rate in the river at the time. Consistent with nearby W2 and W3 measurements. No signs of mining related impact.
W2	23/09/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS considered associated with recent rainfall and increased flow rate in the river at the time. Consistent with nearby W1 and W3 measurements. No signs of mining related impact.

Site	Date	Trigger Limit	Action Taken in Response
W2	10/12/2019	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Note: Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to sampling from slow flowing water following extended period of below average rainfall.
W3	19/06/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS considered associated with recent rainfall and increased flow rate in the river at the time. Consistent with nearby W1 and W2 measurements. No signs of mining related impact.
W3	23/09/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS considered associated with recent rainfall and increased flow rate in the river at the time. Consistent with nearby W1 and W2 measurements. No signs of mining related impact.
W4	31/03/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Field investigation did not identify any mining related sources of sediment. Elevated TSS results most likely attributable to high intensity rainfall event after prolonged dry period (52mm in 24 hours).
W5	09/01/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Field investigation did not identify any mining related sources of sediment. Elevated TSS results considered attributable to sampling from a pool of water with no flow.
W5	08/02/2019	TSS – 50mg/L (ANZECC criteria)	Field investigation did not identify any mining related sources of sediment. Elevated TSS results considered attributable to sampling from a pool of water with no flow.
W5	08/03/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Investigation did not identify any mining related sources of sediment. Elevated TSS results most likely attributable to sampling from a pool of water with no flow.
W14	31/03/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Field investigation did not identify any mining related sources of sediment. Elevated TSS results most likely attributable to high intensity rainfall event after prolonged dry period (52mm in 24 hours).
W15	31/03/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Field investigation did not identify any mining related sources of sediment. Elevated TSS results most likely attributable to high intensity rainfall event after prolonged dry period (52mm in 24 hours).

Site	Date	Trigger Limit	Action Taken in Response
W27	31/03/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS results most likely attributable to high intensity rainfall event after prolonged dry period (52mm in 24 hours). In addition, TSS results were potentially affected by turbid water associated with the overtopping of an MTW sediment dam as a result of greater than design rainfall on 30 March 2019. This is discussed further in Section 8.0.
W28	31/03/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS results most likely attributable to high intensity rainfall event after prolonged dry period (52mm in 24 hours). In addition, TSS results were potentially affected by turbid water associated with the overtopping of an MTW sediment dam as a result of greater than design rainfall on 30 March 2019. This is discussed further in Section 8.0.
SW40	23/09/2019	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS considered associated with recent rainfall (17-19 and 22 September) resulting in mobilisation of sediment after prolonged dry conditions. Unlikely to be associated with MTW mining related impacts. Continue to monitor.



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 2016 TO 2019

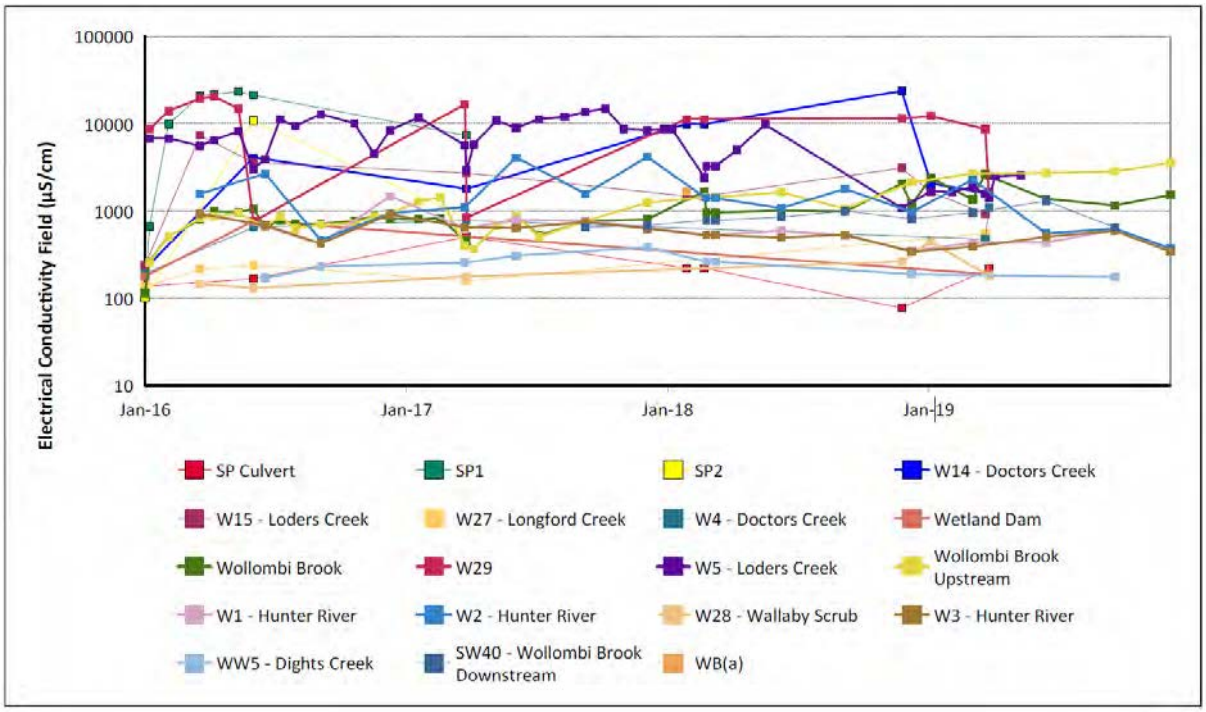


FIGURE 27: WATERCOURSE EC TRENDS 2016 TO 2019

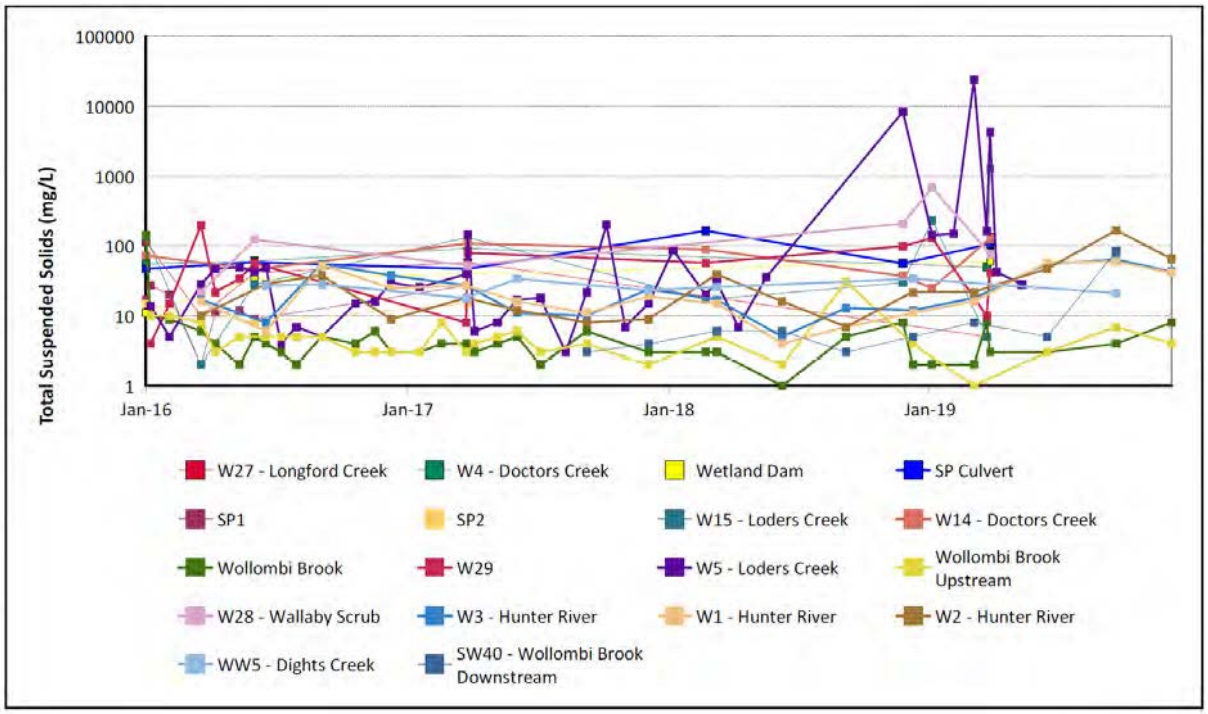


FIGURE 28: WATERCOURSE TSS TRENDS 2016 TO 2019

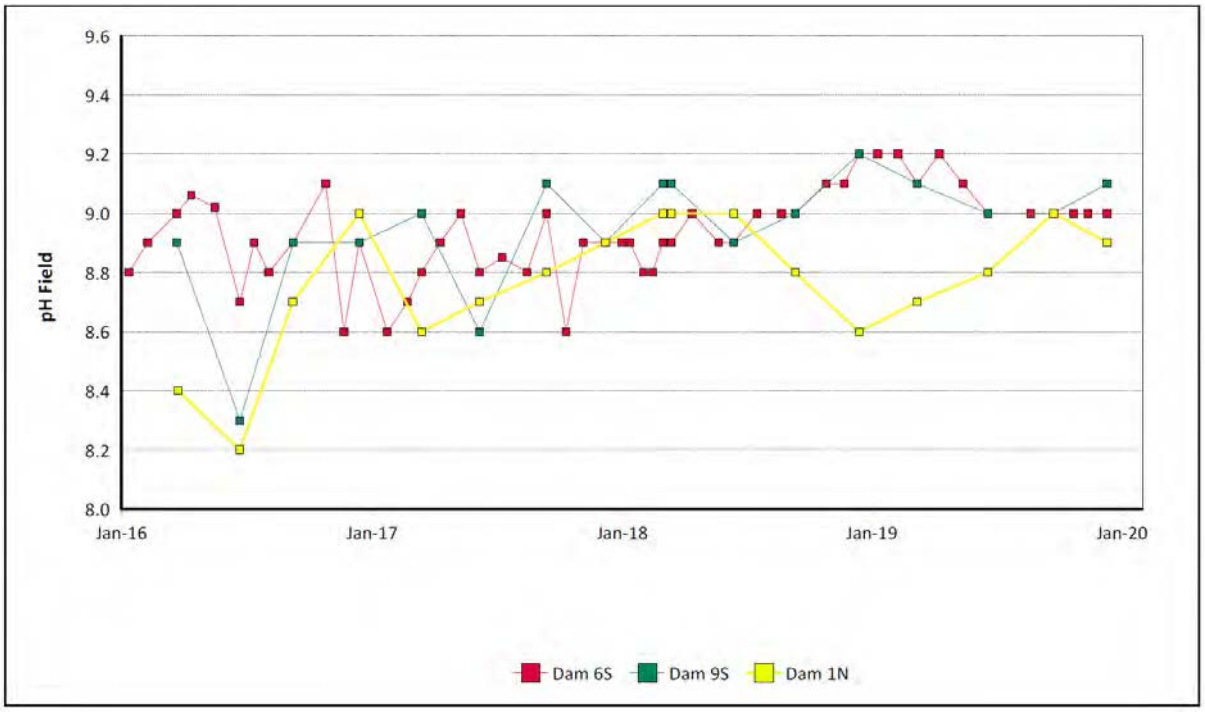


FIGURE 29: SITE DAMS PH TRENDS 2016 TO 2019

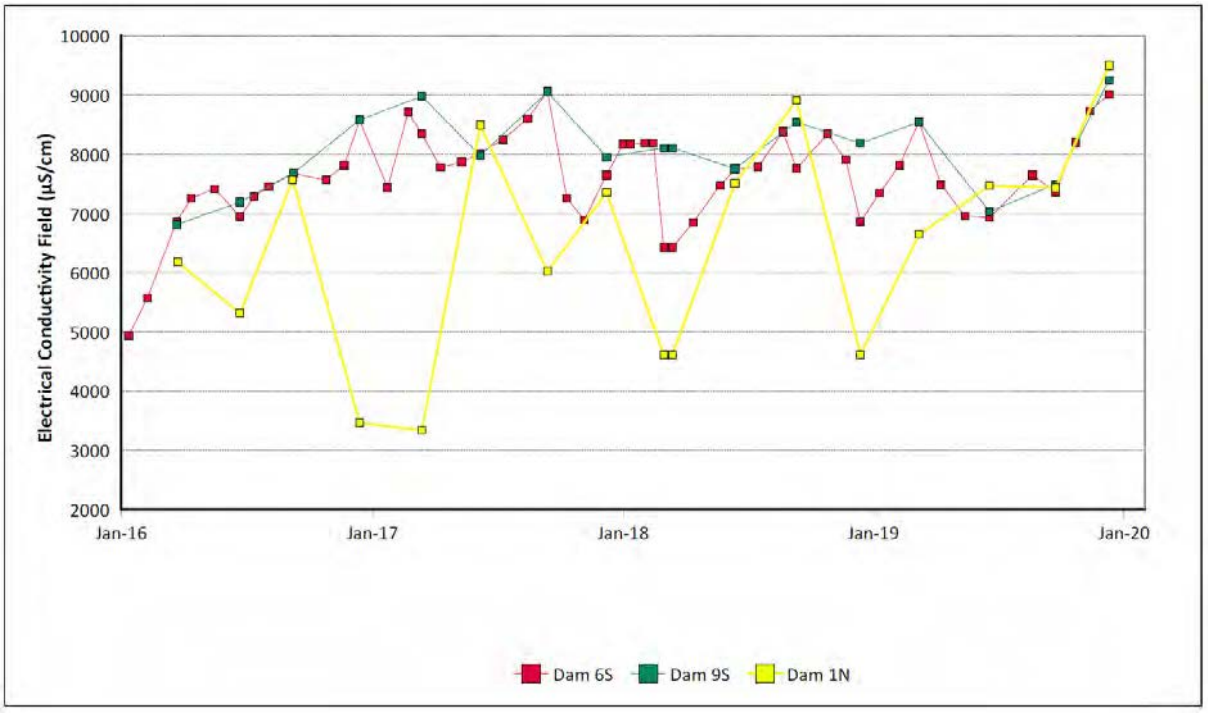


FIGURE 30: SITE DAMS EC TRENDS 2016 TO 2019

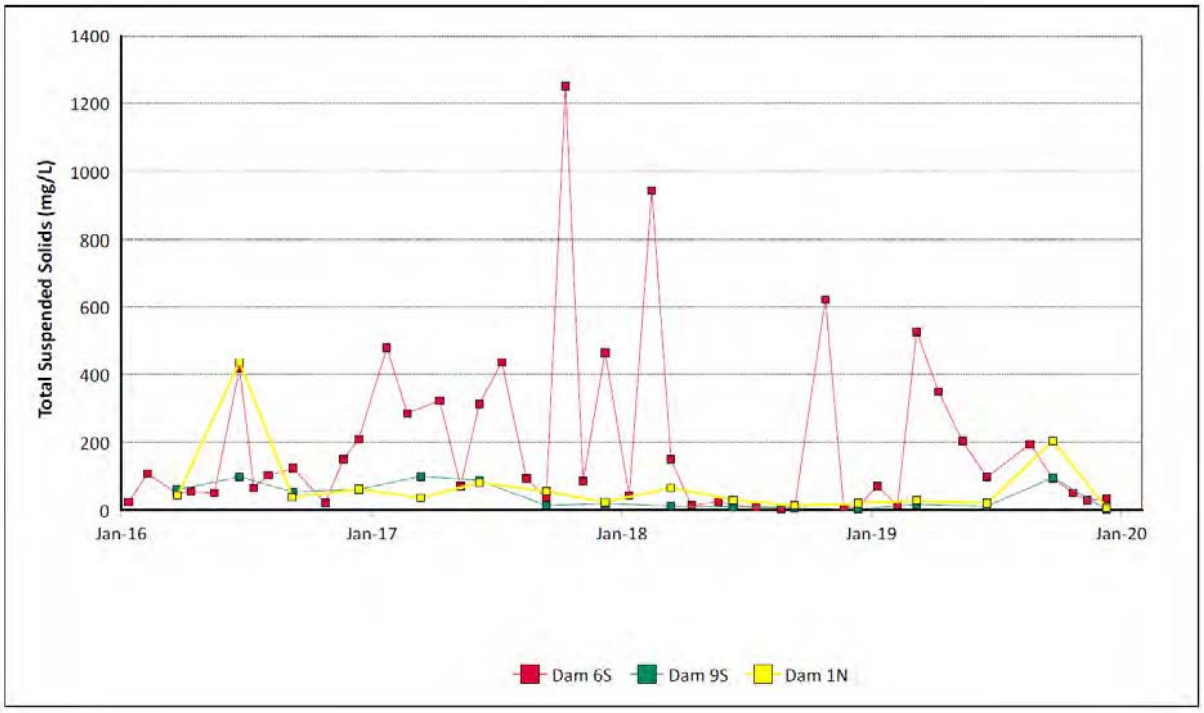


FIGURE 31: SITE DAMS TSS TRENDS 2016 TO 2019

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 is 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 stream health and stability monitoring report is provided as **Appendix 3**. As outlined in the report, stream health and channel stability monitoring results in 2019 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. However, some evidence of minor erosion progression was observed at some of the monitoring points. Many sections of the local creeks experience active erosion as a result of natural influences and are not related to the development. This is exacerbated by dispersive sub-soils in some areas. Improvements were also identified during the 2019 survey, resulting from both natural occurrences as well as man-made upgrade works.

During the previous reporting period MTW undertook creek stability improvement works at its Mount Thorley Operations HRSTS discharge location to improve the stream health and channel stability in this location. This site had a classification of poor before the remediation works were completed. During the 2019 assessment, the site was classified as stabilising.

The 2019 stream health and stability assessment did not identify any direct impacts from MTW's current operations as contributing to a decline in stream health or channel stability. Despite this, MTW undertook an assessment of the LC3 stream monitoring location in the Loders Creek Cultural Heritage Conservation Area during the reporting period to assess whether improvement works are achievable in this zone. During the inspection, it was identified that the area is highly vegetated and that access into the affected zone was difficult without moderate levels of surface disturbance. It was also identified that the area was located within a sensitive cultural heritage management zone with cultural heritage sites in close proximity. MTW is committed to developing a remediation program for the LC3 location in the next reporting period in consultation with a qualified land regeneration consultant and in consultation with the relevant government and community stakeholders.

6.7.5 Groundwater Management

Groundwater monitoring activities were undertaken in 2019 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.**

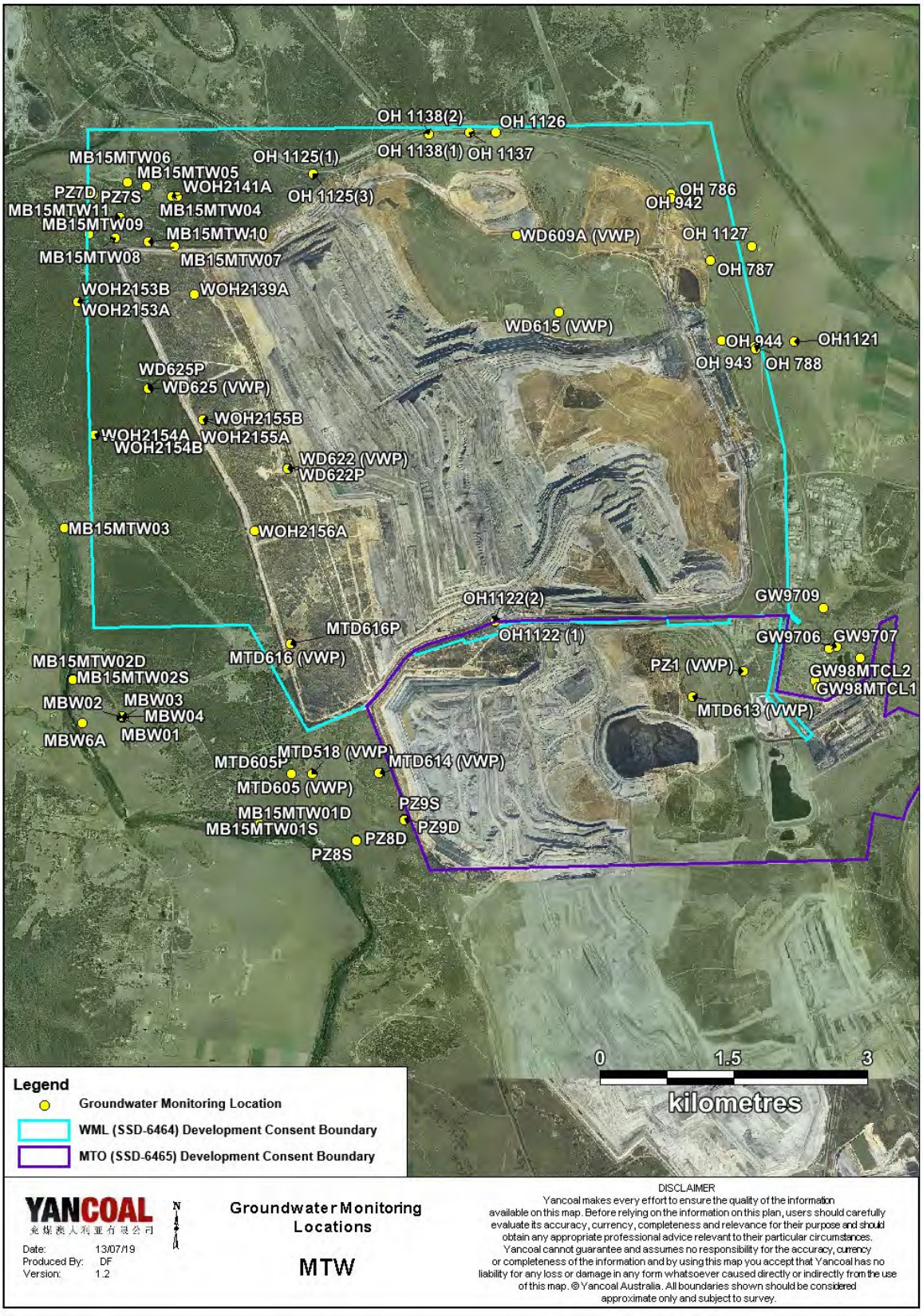


FIGURE 32: GROUNDWATER MONITORING NETWORK AT MTW IN 2019

6.7.6 Groundwater Performance

Sampling of ground waters was carried out on 275 occasions from 59 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 6.17 MTW WATER MONITORING DATA RECOVERY FOR 2019 (BY EXCEPTION)

Location	Data Recovery (%)	Comment
OH943	25%	Insufficient water for sampling in June, September and December
PZ9S	25%	Insufficient water for sampling in June, September and December
GW9709	75%	Insufficient water for sampling in December
MBW02	75%	No access possible in February due to a safety issue
OH1137	25%	Insufficient water for sampling in June, September and December
WOH2153B	25%	Insufficient water for sampling in February, May and August
WOH2156B	25%	Insufficient water for sampling in May, August and November
MB15MTW04	0%	Insufficient water for sampling in 2019
MB15MTW05	0%	Insufficient water for sampling in 2019
MB15MTW06	0%	Insufficient water for sampling in 2019
MB15MTW07	0%	Insufficient water for sampling in 2019
MB15MTW08	0%	Insufficient water for sampling in 2019
MB15MTW09	0%	Insufficient water for sampling in 2019

Location	Data Recovery (%)	Comment
MB15MTW10	0%	Insufficient water for sampling in 2019
MB15MTW11	0%	Insufficient water for sampling in 2019

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

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.

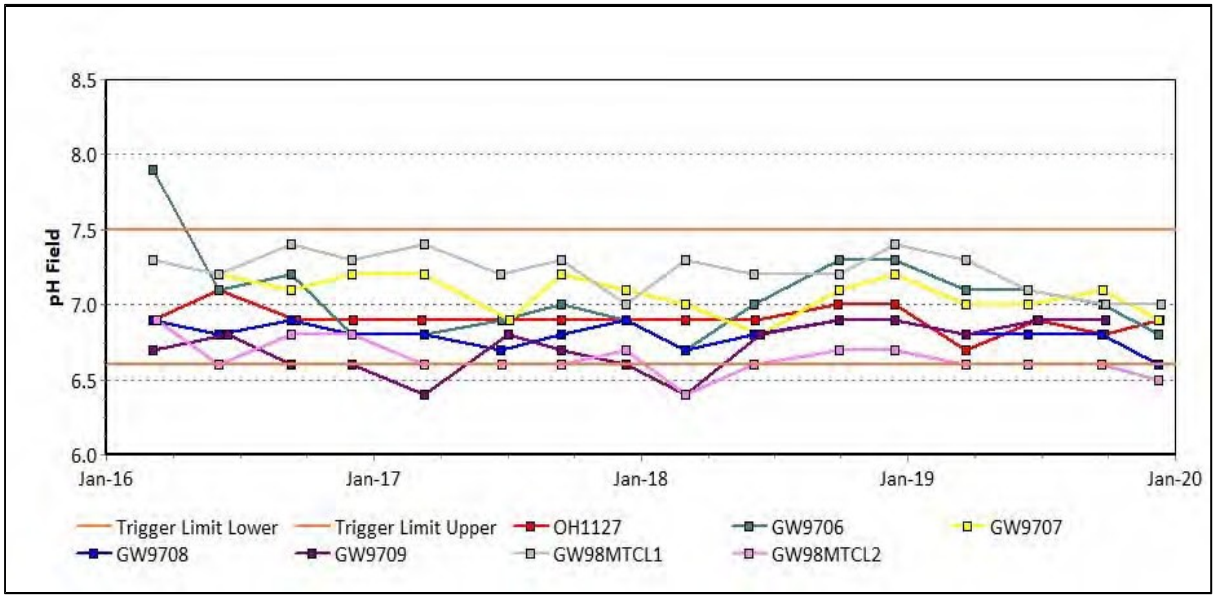
6.7.6.1 Bayswater Seam Bores

Groundwater monitoring in the Bayswater seam was undertaken from seven sites during 2019. A total of 27 samples were collected during the reporting period. The pH, EC and SWL trends for 2016 to 2019 for Bayswater groundwater bores are shown in **Figure 33** to **Figure 35** respectively. Trigger tracking results are given in **Table 6.18**. Results were generally stable and consistent with historical trends. Further detailed overview of monitoring results from these bores is provided in **Appendix 4**.

TABLE 6.18 BAYSWATER SEAM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

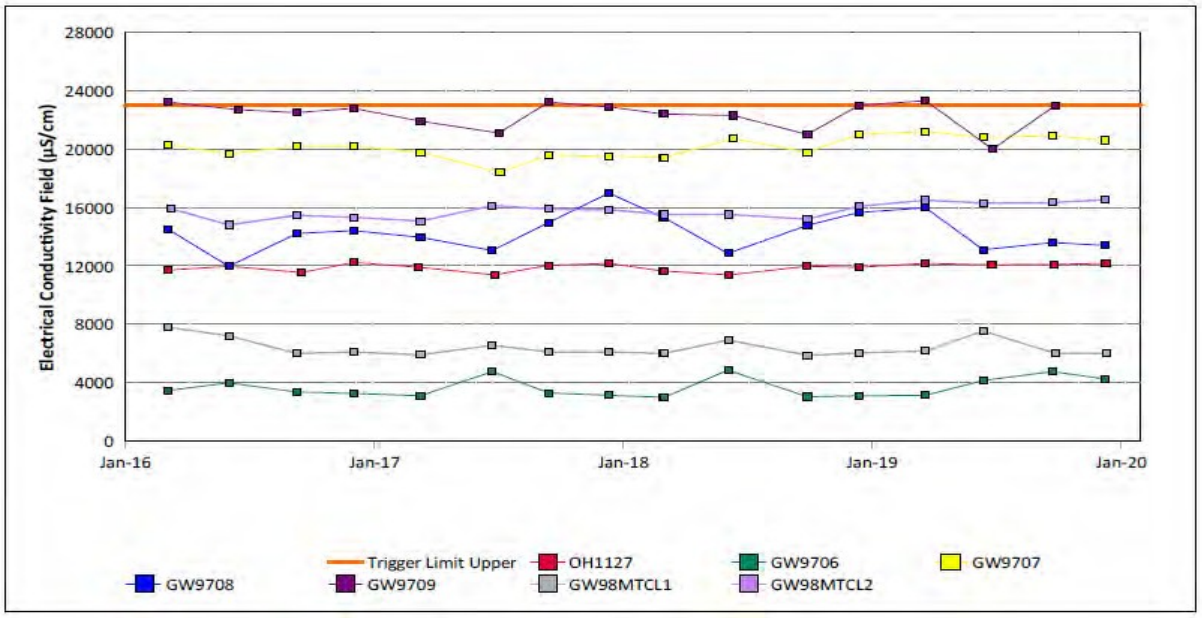
Location	Date	Trigger limit	Action taken in response
GW9709	21/03/2019	**EC – 95th percentile**	Watching Brief* Note: Monitoring result obtained in June 19 shows values back within trigger limits.
GW9709	27/09/2019	**EC – 95th percentile**	Watching Brief* Note: Elevated EC levels likely to be attributed to prolonged dry climatic conditions. Continue to monitor.
GW98MTCL2	09/12/2019	**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 2016 TO 2019



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

FIGURE 34: BAYSWATER SEAM EC TRENDS 2016 TO 2019

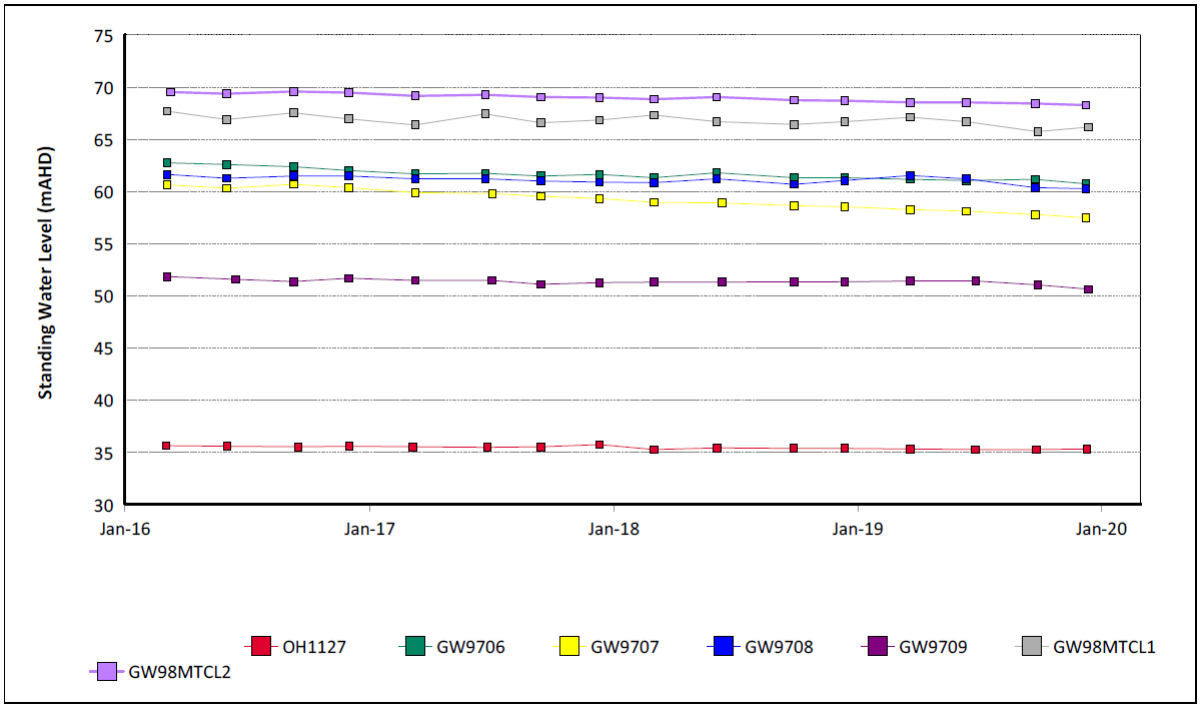


FIGURE 35: BAYSWATER SWL TRENDS 2016 TO 2019

6.7.6.2 Bowfield Seam Bores

Groundwater monitoring in the Bowfield seam was undertaken at one site during 2019. A total of 4 samples were collected during the reporting period. The pH, EC and SWL trends for 2016 to 2019 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 from 47.19 mAHD to 29.71 mAHD during the reporting period. This decline does correspond with the decrease in rainfall over the same period, however, Bore OH1125 is also located directly to the north of North Pit and the decline may be related to a drawdown into the active mine workings in North Pit. The trend may also be influenced by abstraction from LUG Bore located approximately 1.25 km to the north west. The LUG bore intersects the historical Lemington Underground workings, which mined through the deeper Mt Arthur Seam. The increased groundwater level drawdown observed over 2019 may therefore be a combination of the effects of mining of the North Pit and licenced abstraction from the LUG bore.

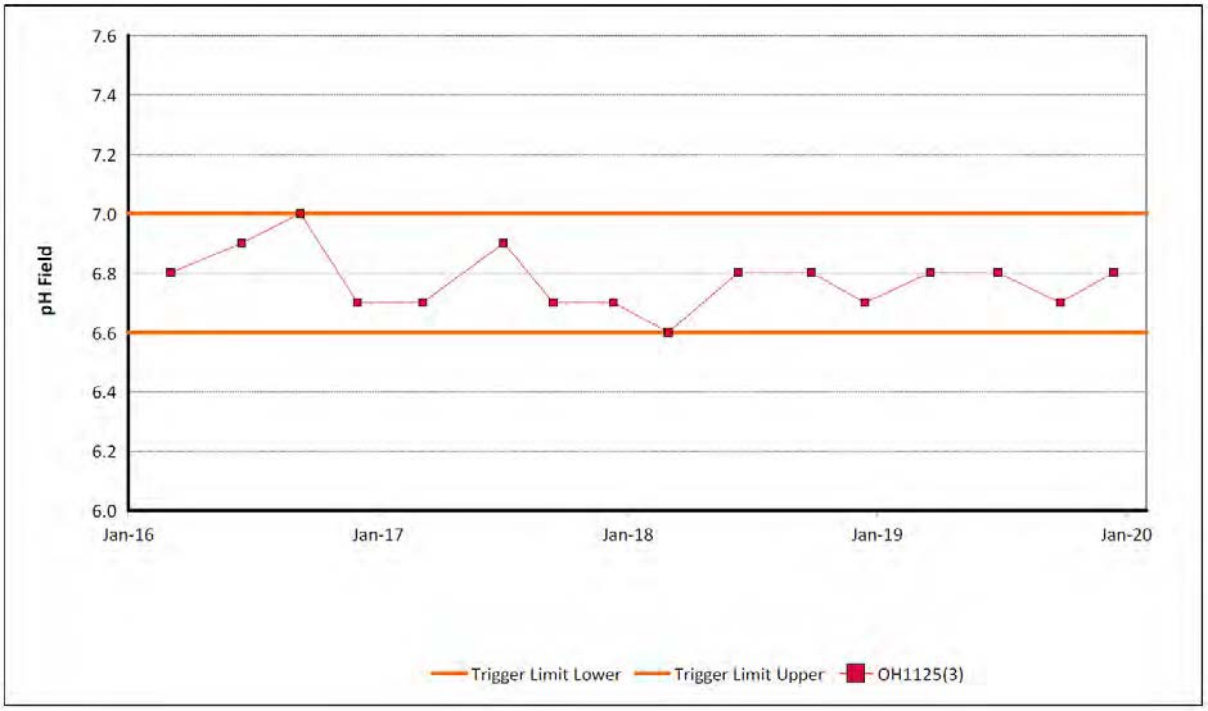


FIGURE 36: BOWFIELD SEAM PH TREND 2016 TO 2019

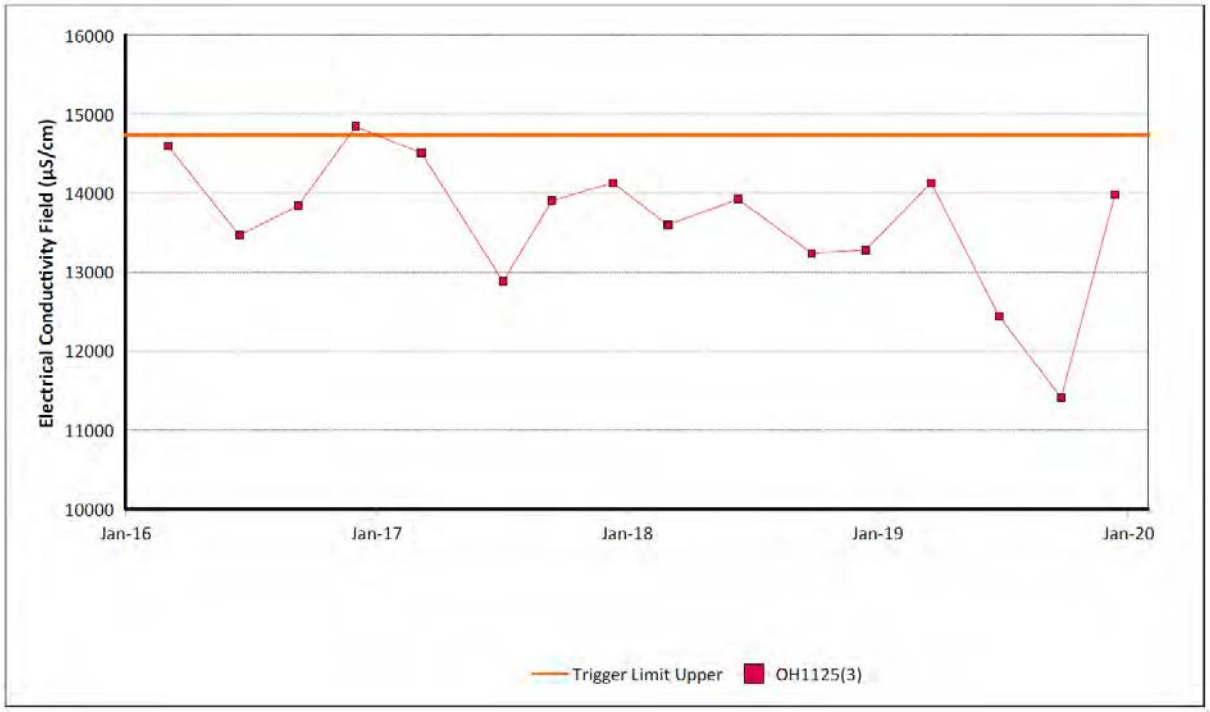


FIGURE 37: BOWFIELD SEAM EC TRENDS 2016 TO 2019

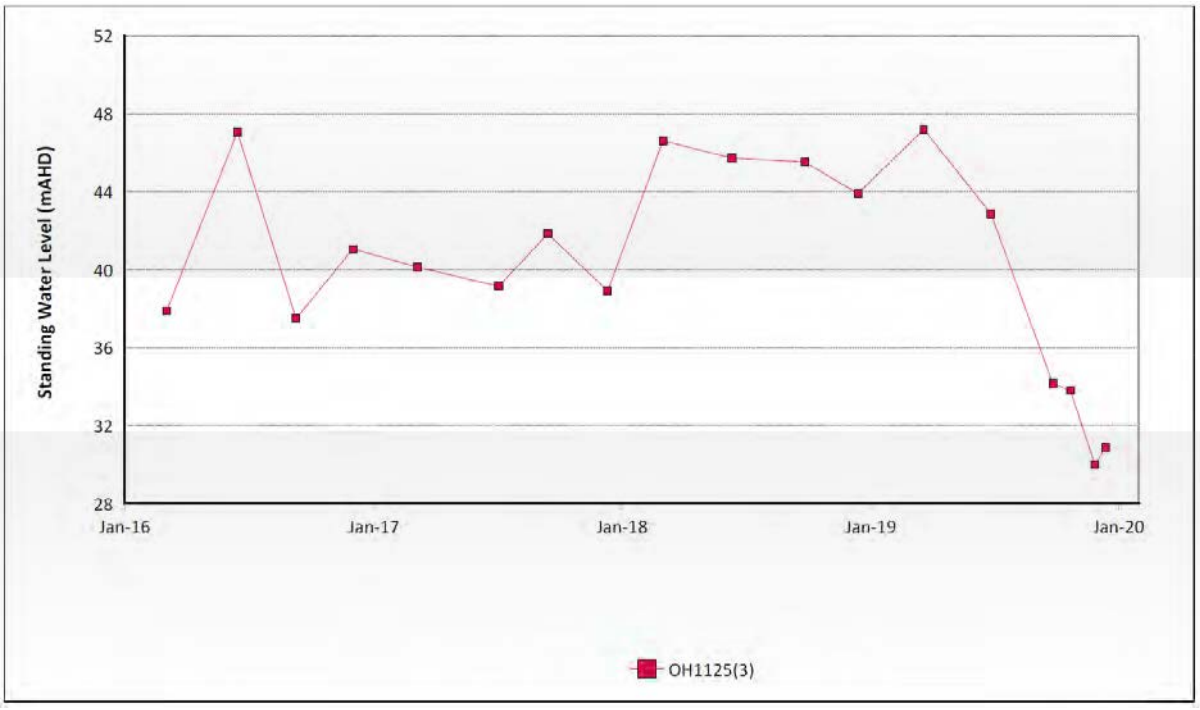


FIGURE 38: BAYSWATER SWL TRENDS 2016 TO 2019

6.7.6.3 Blakefield Seam Bores

Groundwater monitoring in the Blakefield seam was undertaken from three sites during 2019. A total of 20 samples were collected during the reporting period. The pH, EC and SWL trends for 2016 to 2019 are shown in **Figure 39, Figure 40** and **Figure 41** respectively. Water quality trends were generally steady with an increasing pH and EC trend observed in WOH2139A. The elevated EC is likely a result of the declining water levels due to depressurisation from the open cut operations.

Over 2019 groundwater levels generally declined within the Blakefield Seam bores OH1125 (1) and WOH2139A. Groundwater levels within OH1122 remained relatively stable throughout the reporting period. In response to the active mine progression Bore OH1125(1) recorded a 3.5 m decline, Bore WOH2139A recorded a 5.7 m decline and Bore OH1122(1) recorded a 0.2 m decline over 2019. The SWL results are described further in the Annual Groundwater Review (**Appendix 4**). Trigger tracking results are given in **Table 6.19**.

TABLE 6.19 BLAKEFIELD SEAM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
WOH2139A	22/01/2019	**pH - 95th percentile**	Watching Brief* Investigation undertaken. pH values for WOH2139A considered to be associated with prolonged dry climatic conditions and are consistent with results obtained since 2017 at this location. Monitoring to be moved to quarterly.
	08/02/2019		
	21/03/2019		
	09/04/2019		
	14/05/2019		
	18/06/2019		
	16/07/2019		
	26/08/2019		
	26/09/2019		
	22/10/2019		
	26/11/2019		
	13/12/2019		

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

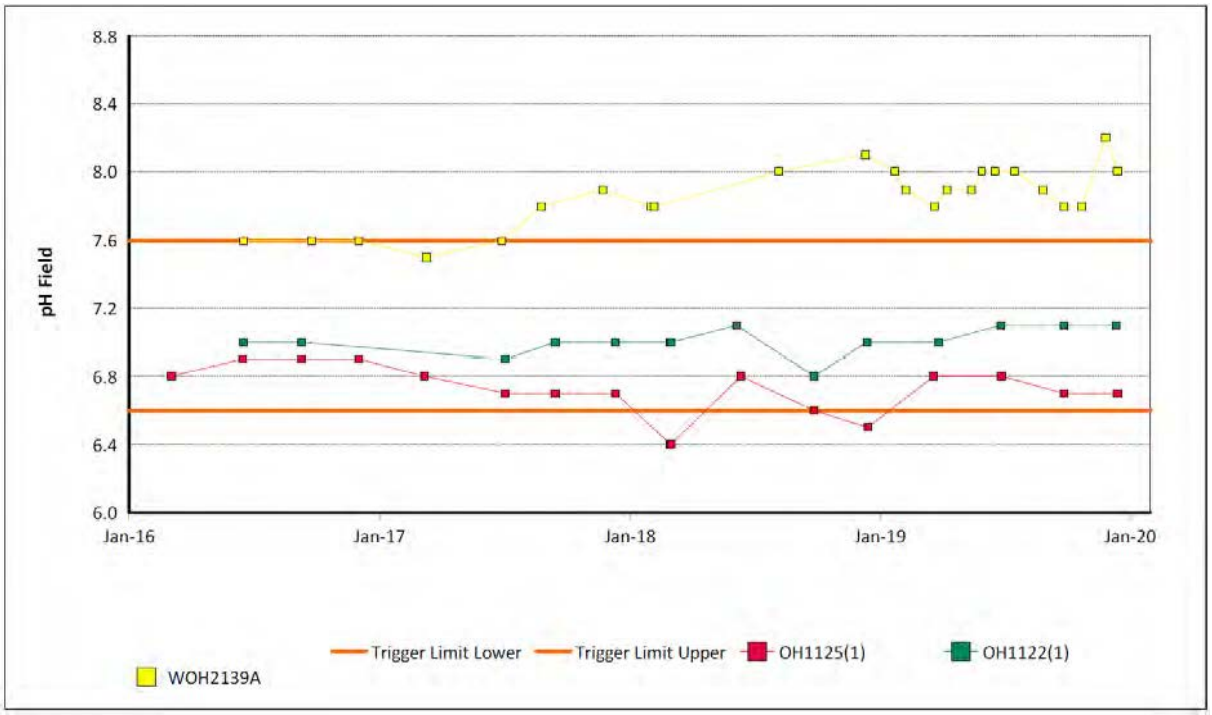


FIGURE 39: BLAKEFIELD SEAM GROUNDWATER PH TRENDS 2016 TO 2019

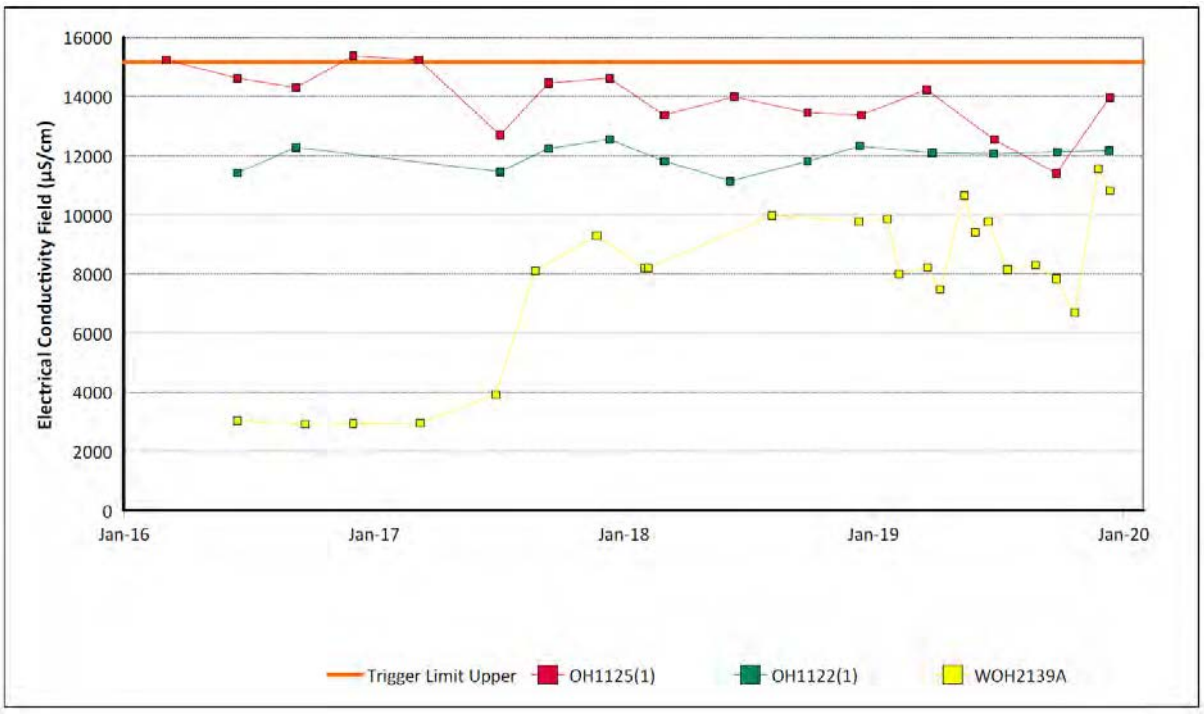


FIGURE 40: BLAKEFIELD SEAM GROUNDWATER EC TRENDS 2016 TO 2019

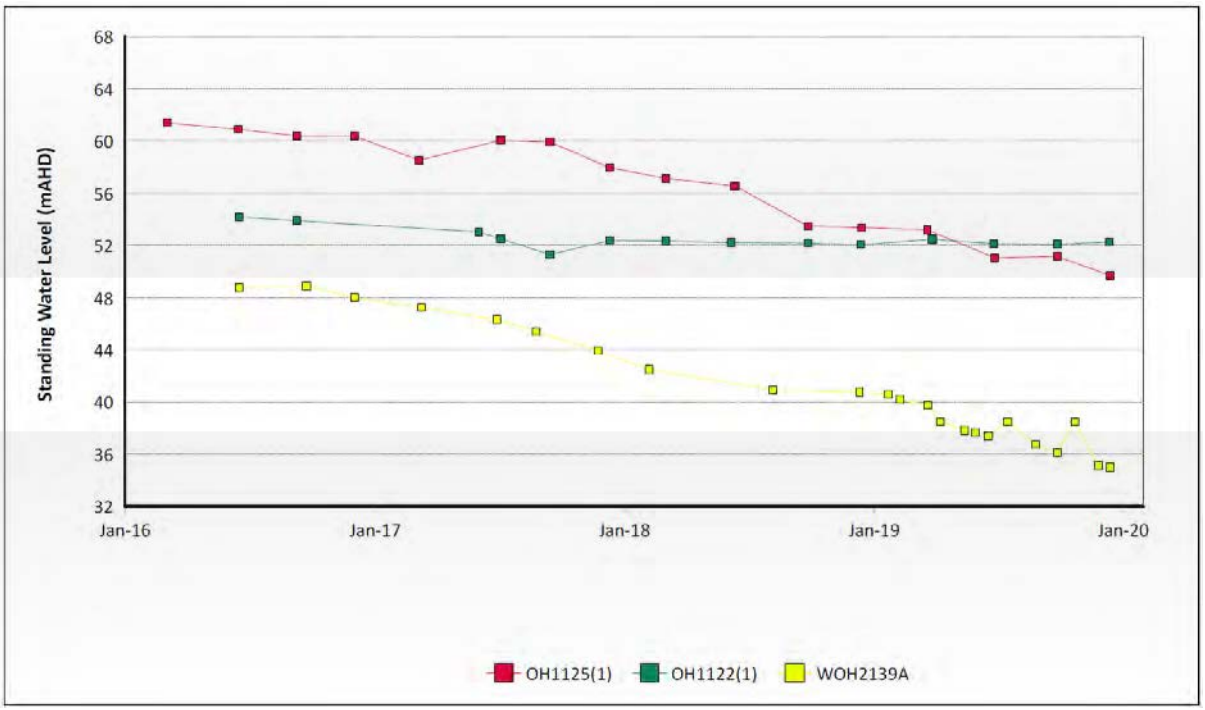


FIGURE 41: BLAKEFIELD SEAM GROUNDWATER SWL TRENDS 2016 TO 2019

6.7.6.4 Hunter River Alluvium Bores

Groundwater monitoring in the Hunter River Alluvium was undertaken from five sites during 2019. A total of 17 samples were collected during the reporting period. The pH, EC and SWL trends for 2016 to 2019 for Hunter River Alluvium groundwater bores are shown in **Figure 42** to **Figure 52**. Over the 2019 monitoring period bore OH788 recorded pH levels at and marginally below the lower trigger level of 7.1 throughout 2019. EC concentrations were also recorded above the trigger level of 11,742 µS/cm in Q2, Q3 and Q4.

Over 2019, all of the Hunter River Alluvium bores showed stable SWL results consistent with historical trends.

TABLE 6.20 HUNTER RIVER ALLUVIUM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
OH786	20/03/2019	**EC – 95th percentile**	Watching Brief* Note: Monitoring result obtained in June 19 was within trigger limits.
	26/09/2019		Watching Brief* Note: Elevated EC levels likely to be attributed to prolonged dry climatic conditions. Continue to monitor.
	10/12/2019		Watching Brief*
OH787	20/03/2019	**EC – 95th percentile**	Watching Brief* Note: Monitoring result obtained in June 19 and September shows values back within trigger limits.
	12/12/2019		Watching Brief*
OH942	20/03/2019	**EC – 95th percentile**	Watching Brief*
	26/06/2019		Watching Brief* Note: Monitoring result obtained in September 19 was within trigger limits. No further action required.
OH788	25/06/2019	**EC – 95th percentile**	Watching Brief* Note: Elevated EC levels likely to be attributed to prolonged dry climatic conditions. Continue to monitor.
	25/09/2019		Watching Brief* Note: Elevated EC levels likely to be attributed to prolonged dry climatic conditions. Continue to monitor.
	12/12/2019		Investigation Undertaken. Elevated EC levels likely to be attributed to prolonged dry climatic conditions.
OH788	25/09/2019	**pH – 5th percentile**	Watching Brief*

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

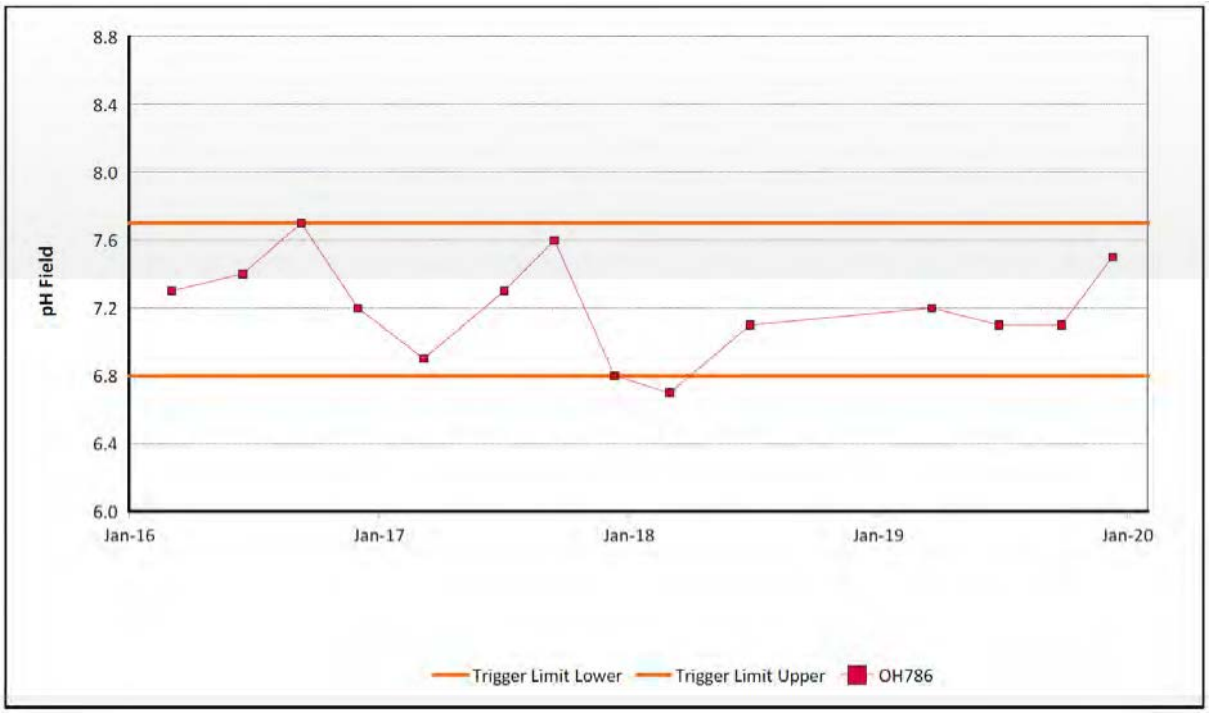


FIGURE 42: HUNTER RIVER ALLUVIUM BORE OH786 PH TREND 2016 TO 2019

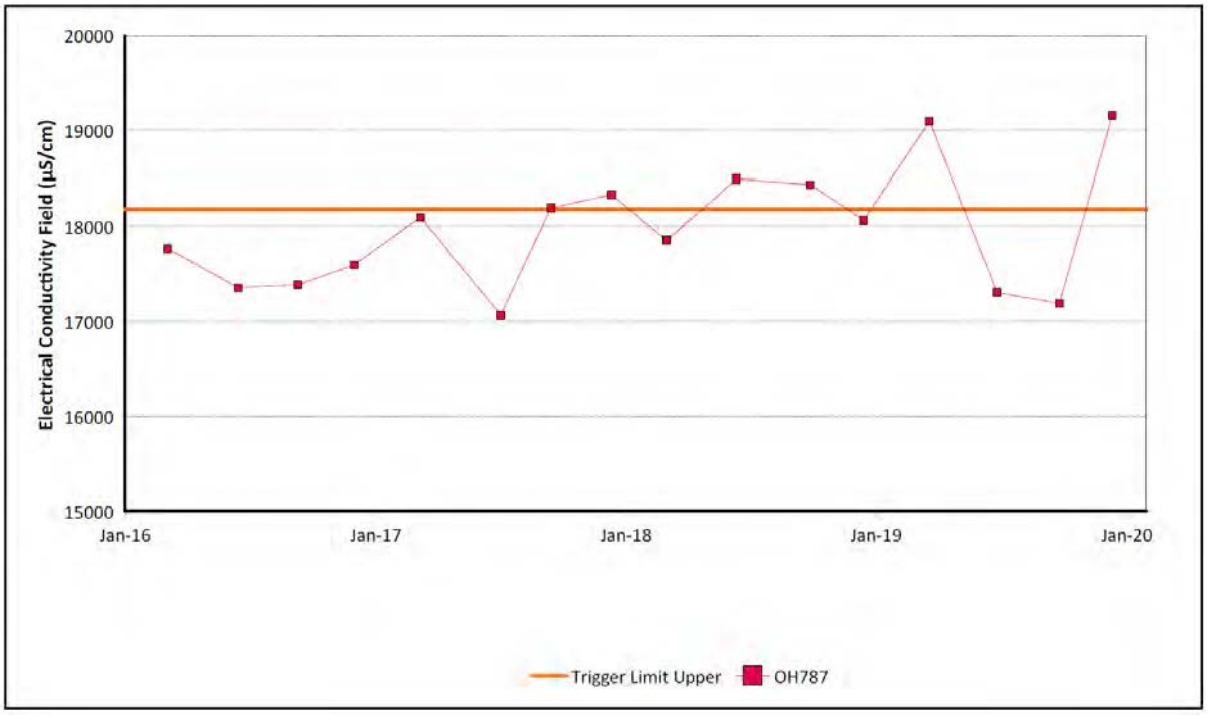


FIGURE 43: HUNTER RIVER ALLUVIUM BORE OH786 EC TREND 2016 TO 2019

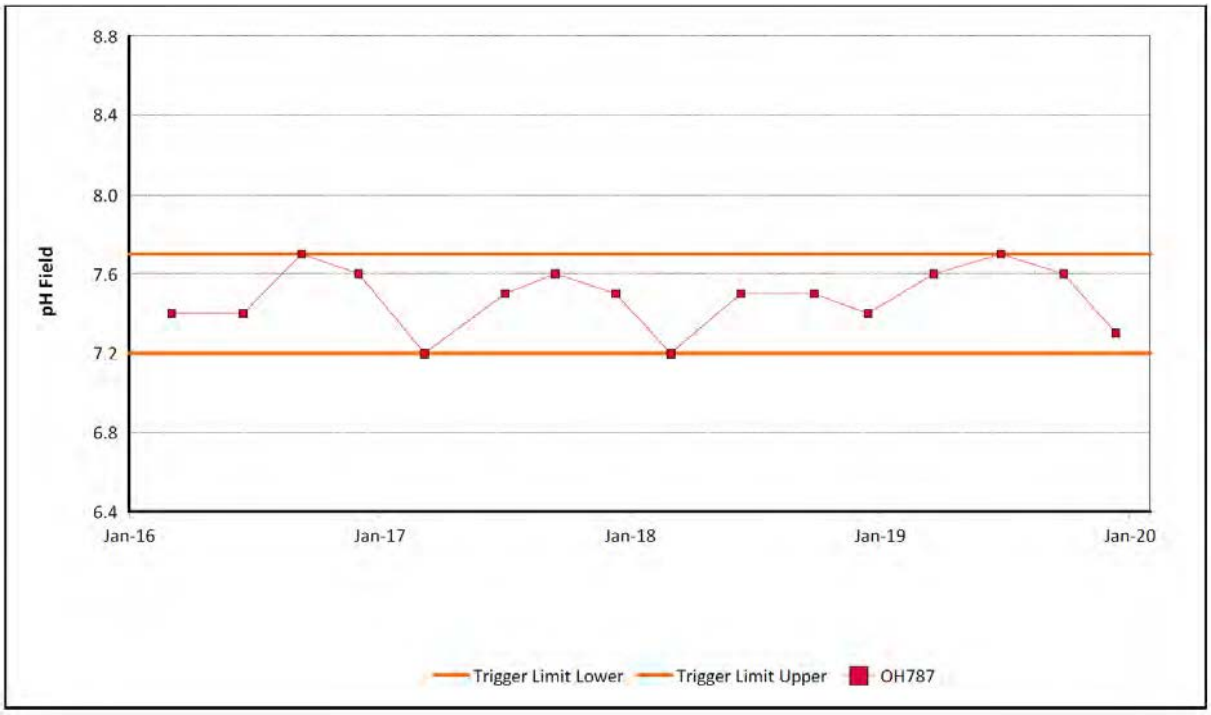


FIGURE 44: HUNTER RIVER ALLUVIUM BORE OH787 PH TREND 2016 TO 2019

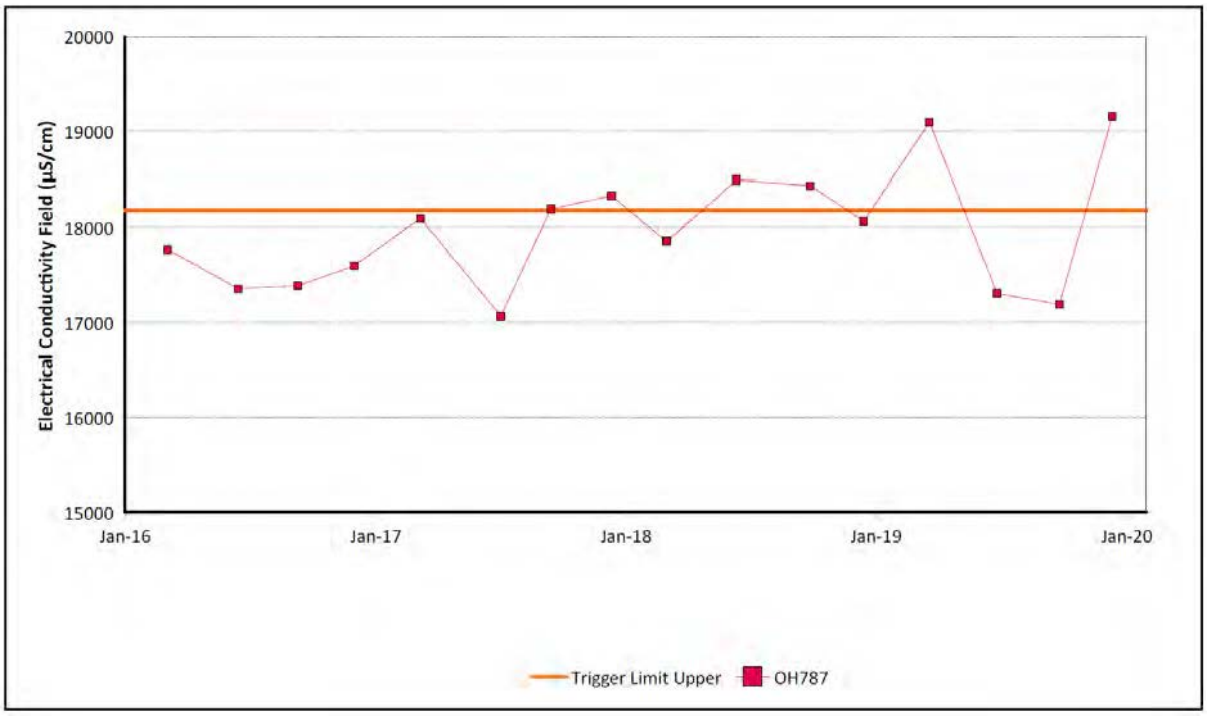


FIGURE 45: HUNTER RIVER ALLUVIUM BORE OH787 EC TREND 2016 TO 2019

FIGURE 46: HUNTER RIVER ALLUVIUM BORE OH942 PH TREND 2016 TO 2019

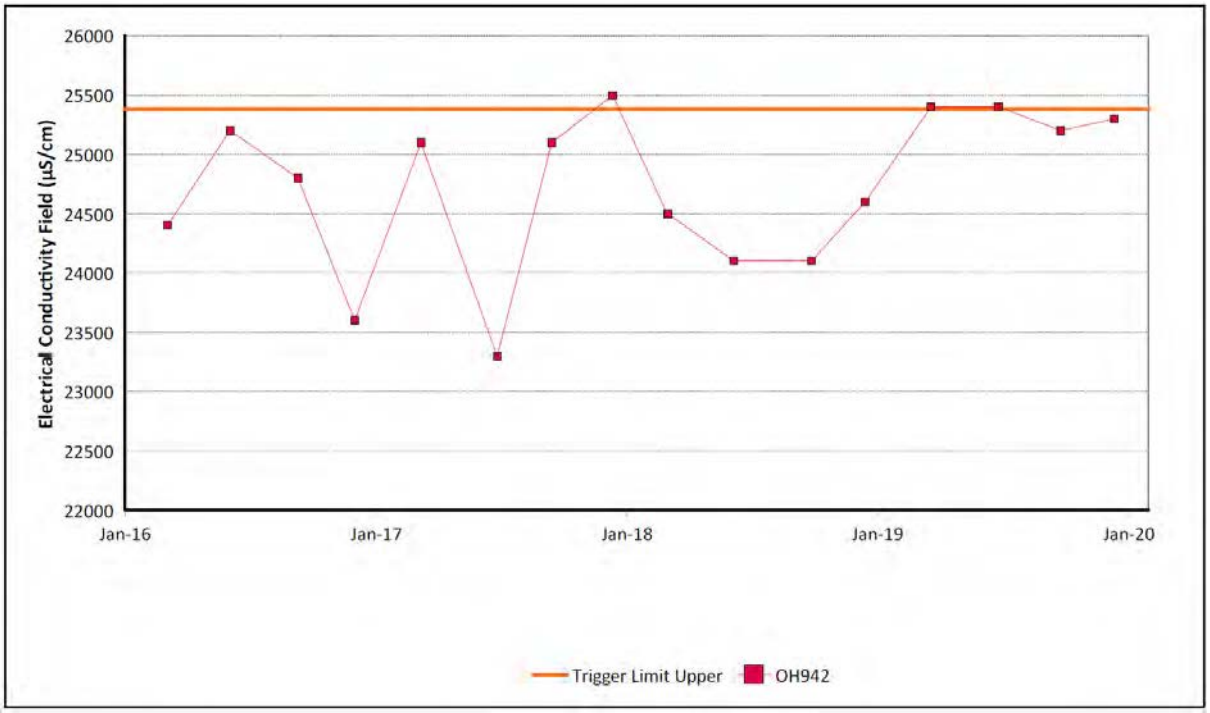
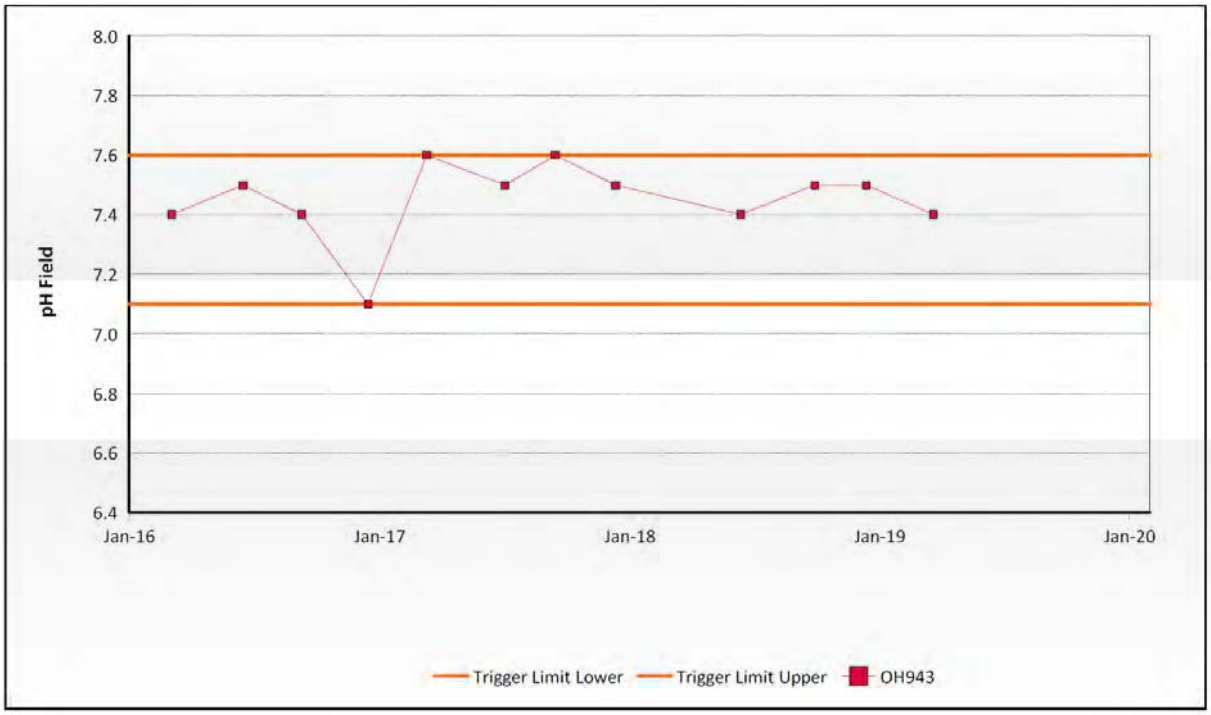
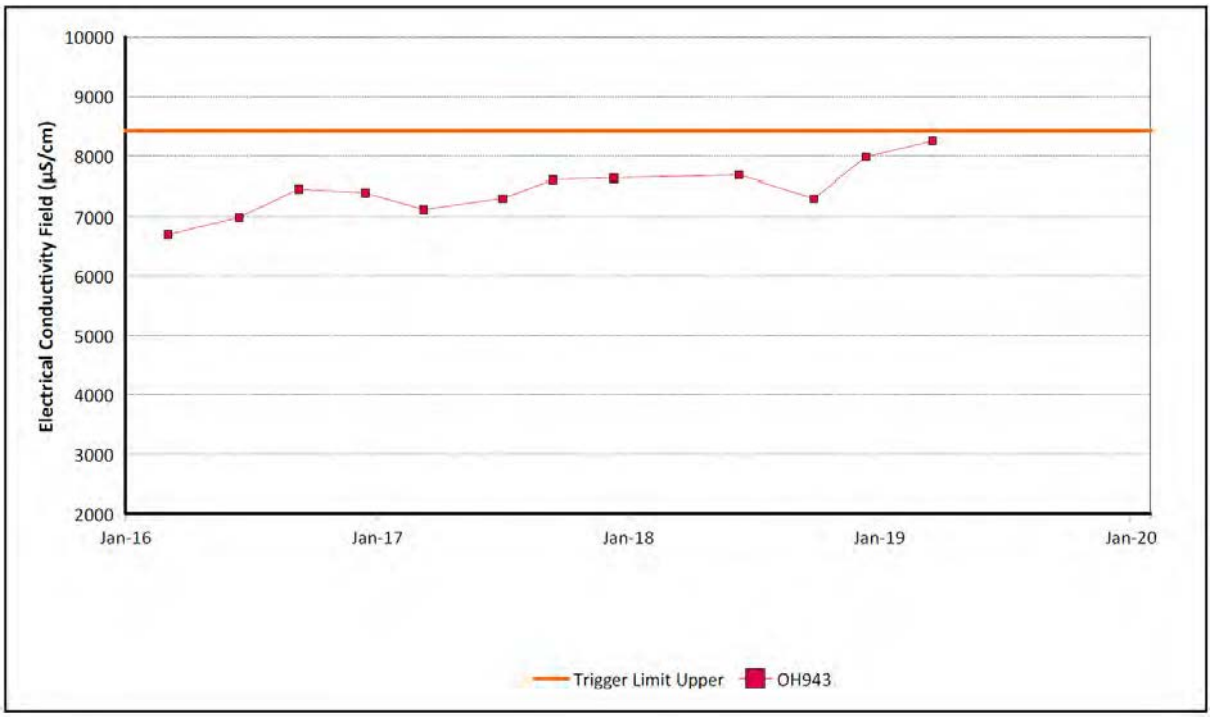


FIGURE 47: HUNTER RIVER ALLUVIUM BORE OH942 EC TREND 2016 TO 2019



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

FIGURE 48: HUNTER RIVER ALLUVIUM BORE OH943 PH TREND 2016 TO 2019



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

FIGURE 49: HUNTER RIVER ALLUVIUM BORE OH943 EC TREND 2016 TO 2019

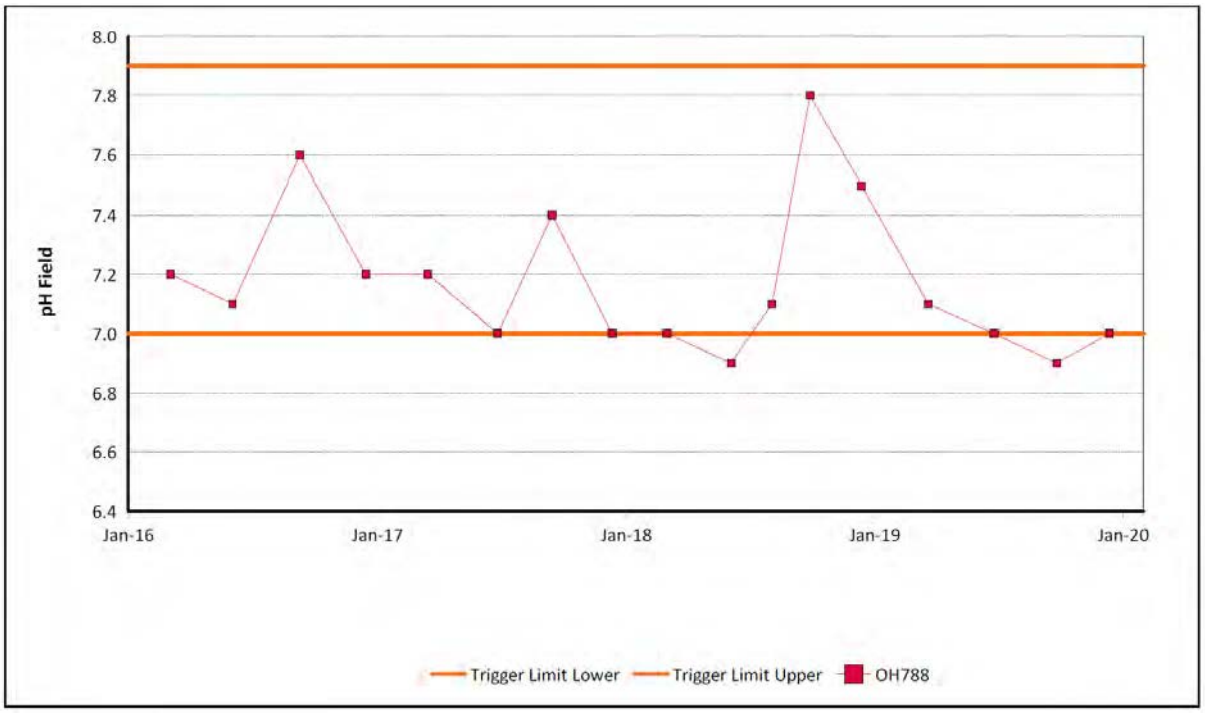


FIGURE 50: HUNTER RIVER ALLUVIUM BORE OH788 PH TREND 2016 TO 2019

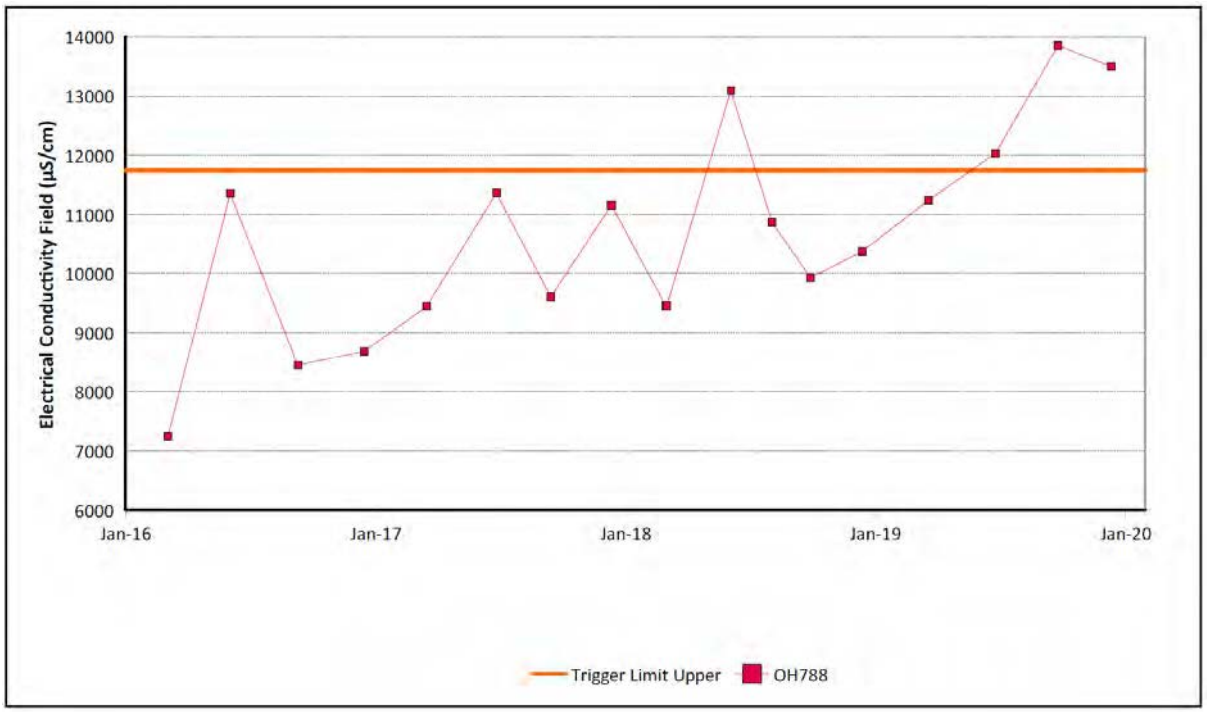


FIGURE 51: HUNTER RIVER ALLUVIUM BORE OH788 EC TREND 2016 TO 2019

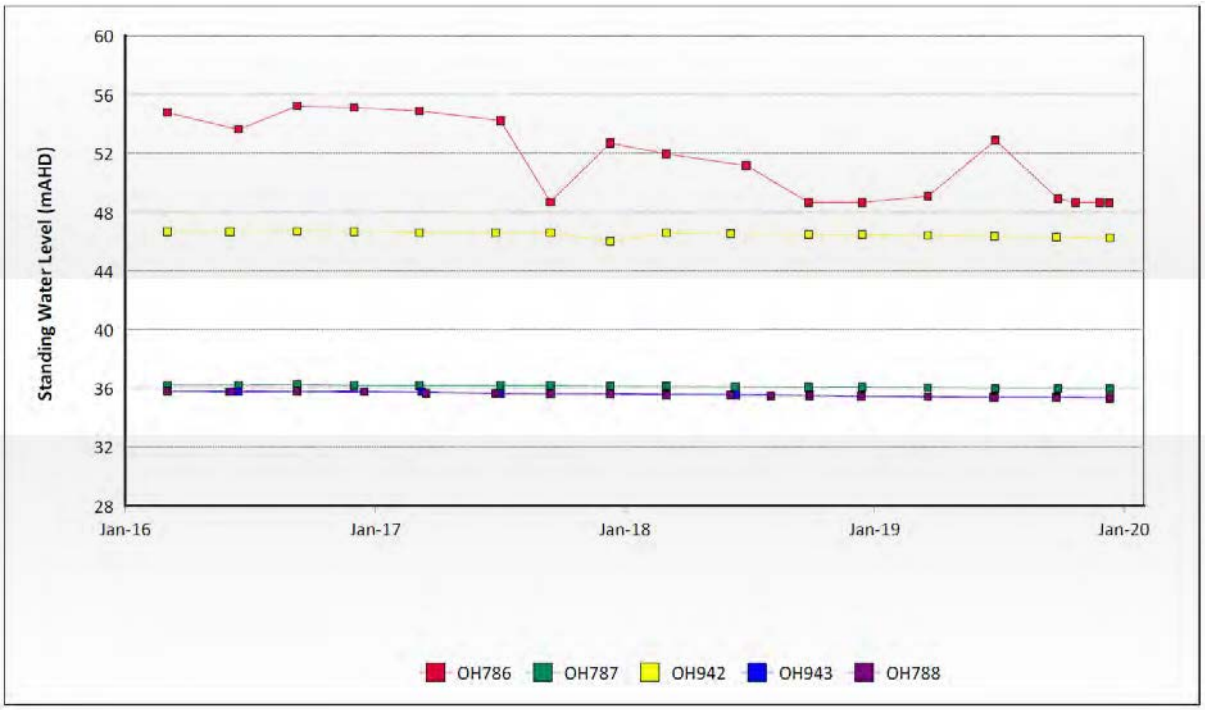


FIGURE 52: HUNTER RIVER ALLUVIUM GROUNDWATER SWL TRENDS 2016 TO 2019

6.7.6.5 Redbank Bores

Groundwater monitoring in the Redbank seam was undertaken from four sites during 2019. A total of 16 samples were collected during the reporting period. The pH, EC and SWL trends for 2016 to 2019 for Redbank seam groundwater bores are shown in **Figure 53**, **Figure 54** and **Figure 55** respectively. 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 6.21 REDBANK SEAM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
WOH2153A	26/08/2019	**pH – 95th Percentile**	Watching Brief*
	26/11/2019		Watching Brief*
WOH2154A	01/03/2019	**pH – 5th Percentile**	Watching Brief* Note: Monitoring result obtained in May 19 shows values back within trigger limits. No further action required.

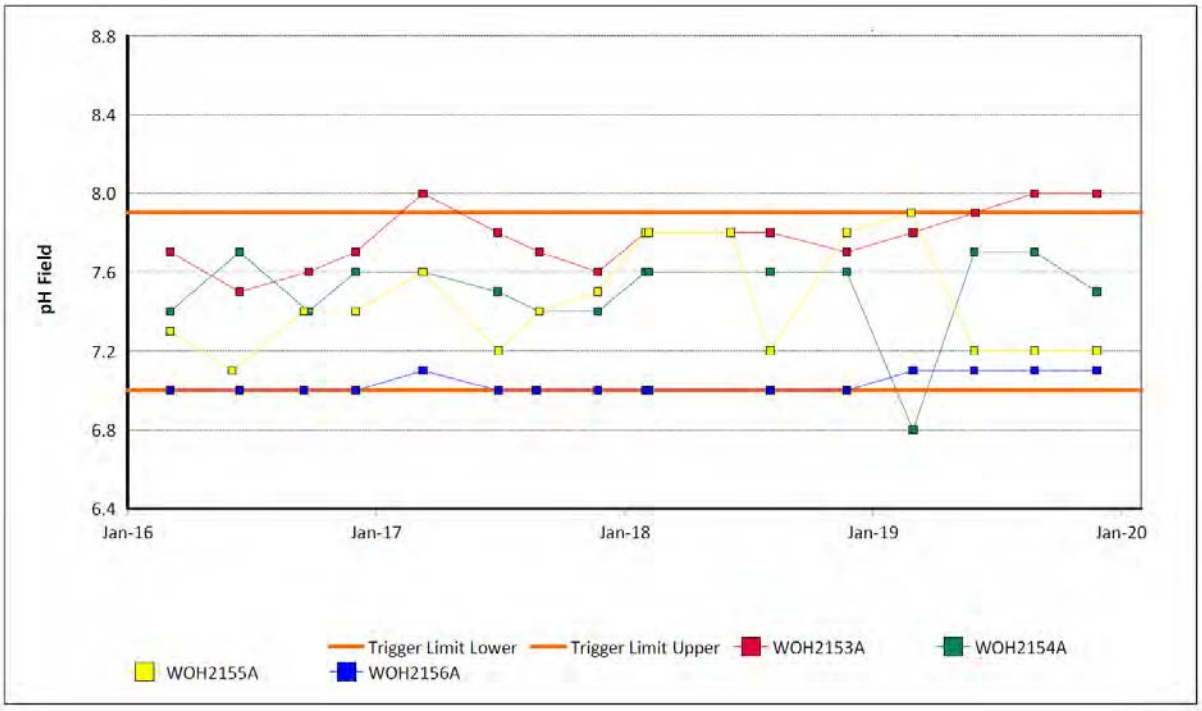


FIGURE 53: REDBANK SEAM GROUNDWATER PH TRENDS 2016 TO 2019

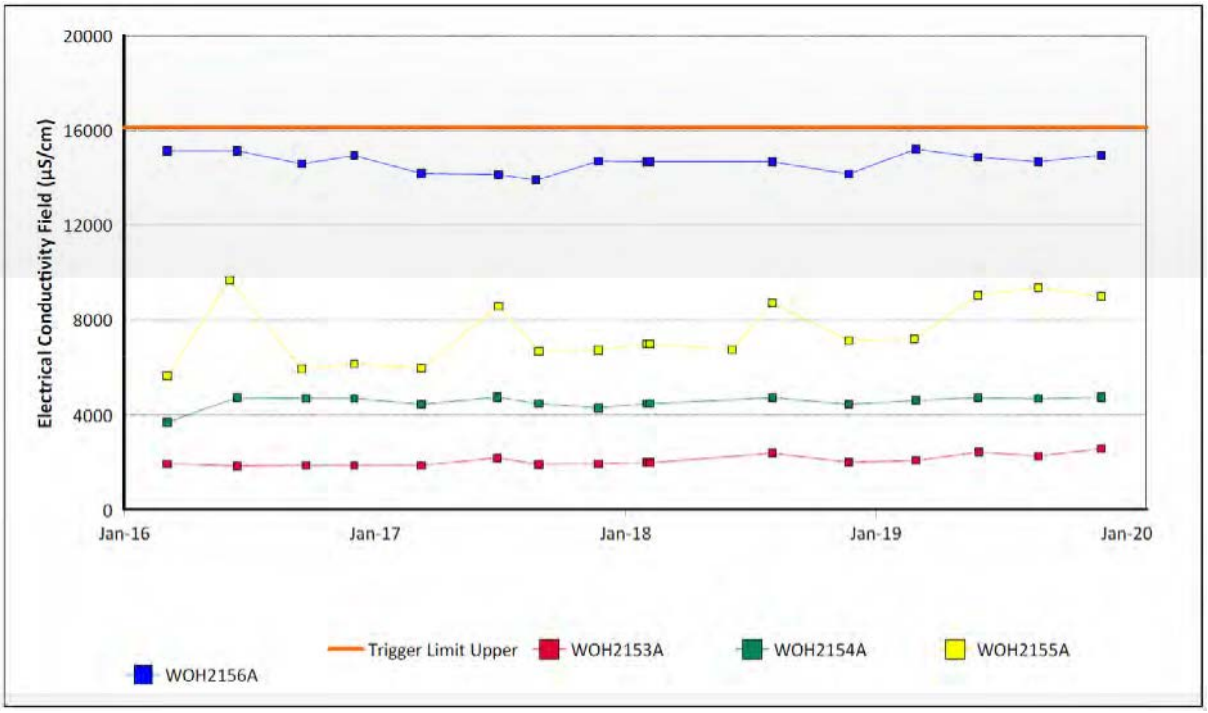


FIGURE 54: REDBANK SEAM GROUNDWATER EC TRENDS 2016 TO 2019

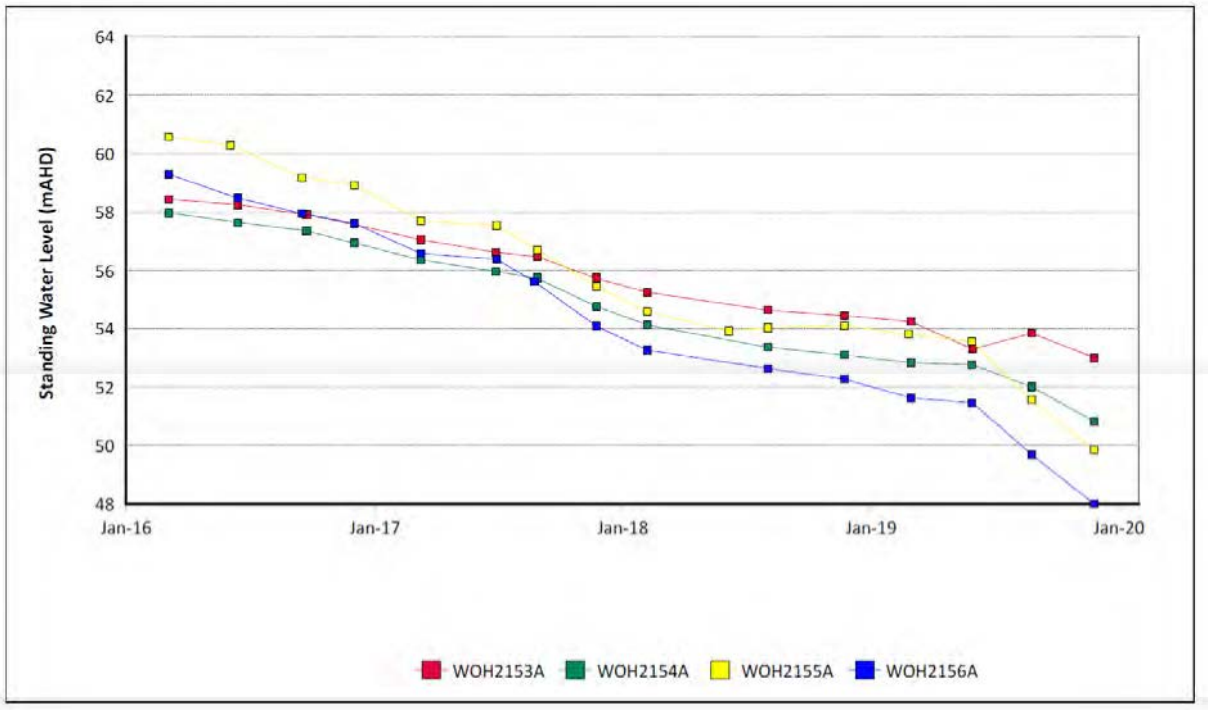


FIGURE 55: REDBANK SEAM GROUNDWATER SWL TRENDS 2016 TO 2019

6.7.6.6 Shallow Overburden Bores

Groundwater monitoring in the Shallow Overburden bores was undertaken from ten sites during 2019. A total of 39 samples were collected during the reporting period. The pH, EC and SWL trends for 2016 to 2019 for Shallow Overburden groundwater bores are shown in **Figure 56**, **Figure 57** and **Figure 58** respectively.

Water levels and water quality were generally in line with historical values across these bores during the reporting period. Groundwater level trends for bores MTD605P, MTD614P, MTD616P, and MBW02 showed stable to slightly declining groundwater levels within the shallow overburden material. The exception to this were bores MTD616P and MTD614P in which slightly increasing groundwater levels were recorded. No land use changes or activities are known to have occurred near the bores that may have caused this rising trend.

TABLE 6.22 SHALLOW OVERBURDEN SEAM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
MTD605P	25/11/2019	**EC – 95th percentile**	Watching Brief*
MTD616P	27/05/2019	**pH – 5th percentile**	Watching Brief*
	27/08/2019		Watching Brief*
	25/11/2019		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.
MB15MTW01D	19/02/2019	**pH – 5th percentile**	Watching Brief*
	27/05/2019		Watching Brief*
	30/08/2019		Investigation undertaken.
	27/11/2019		Note: pH values for MB15MTW01D consistent with prolonged dry weather and are consistent with results obtained over the last 24 months at this location.

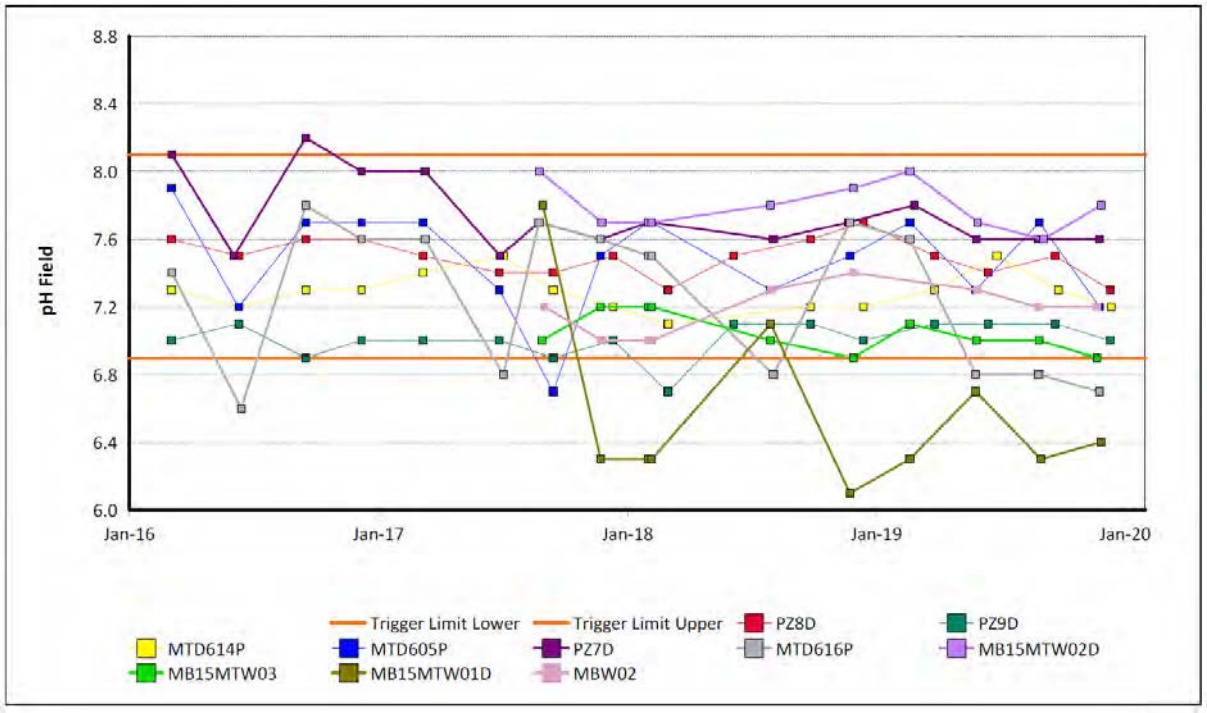


FIGURE 56: SHALLOW OVERBURDEN SEAM GROUNDWATER PH TRENDS 2016 TO 2019

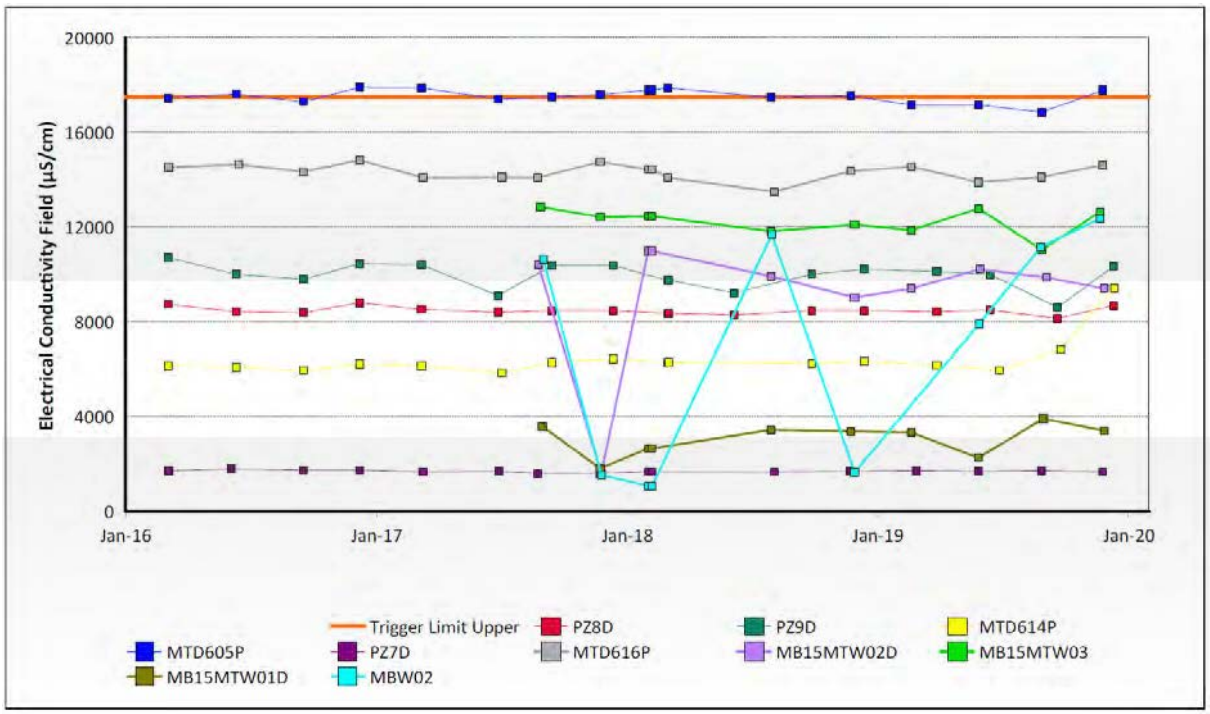


FIGURE 57: SHALLOW OVERBURDEN SEAM GROUNDWATER EC TRENDS 2016 TO 2019

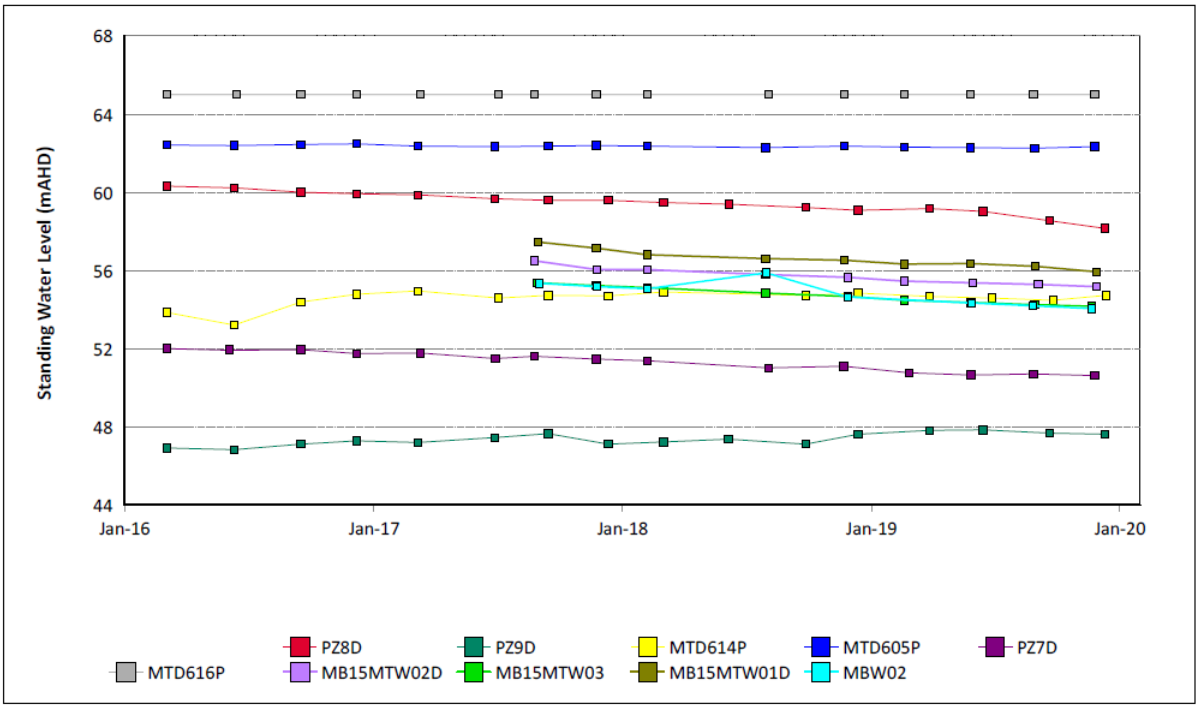


FIGURE 58: SHALLOW OVERBURDEN SEAM GROUNDWATER SWL TRENDS 2016 TO 2019

6.7.6.7 Vaux Seam Bores

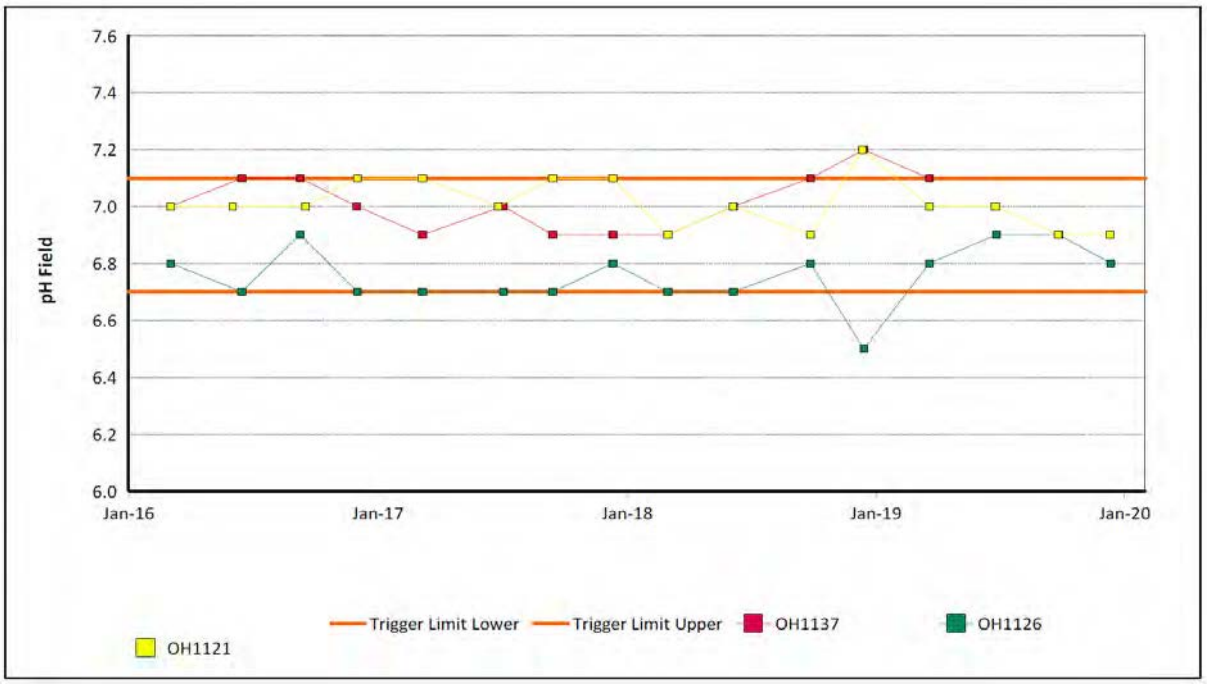
Groundwater monitoring in the Vaux Seam was undertaken from three sites during 2019; a total of 9 samples were collected. The pH, EC and SWL trends for 2016 to 2019 for Vaux groundwater bores are shown in **Figure 59**, **Figure 60** and **Figure 61** respectively. Bores OH1126 and OH1121 showed elevated EC results during the reporting period. It is likely that the values recorded are a result of the dry climatic conditions and the new sampling methodology that was adopted during the reporting period. Monitoring of these bores will continue in the next reporting period.

Historical groundwater level trends for the Vaux seam bores show that over 2019 groundwater elevations within the Vaux Seam, north of North Pit, (OH1126 and OH1137) ranged between 46.18 mAHD and 53.08 mAHD. Levels declined by up to 0.55 m with OH1137 reported as dry from September 2019. 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 2019.

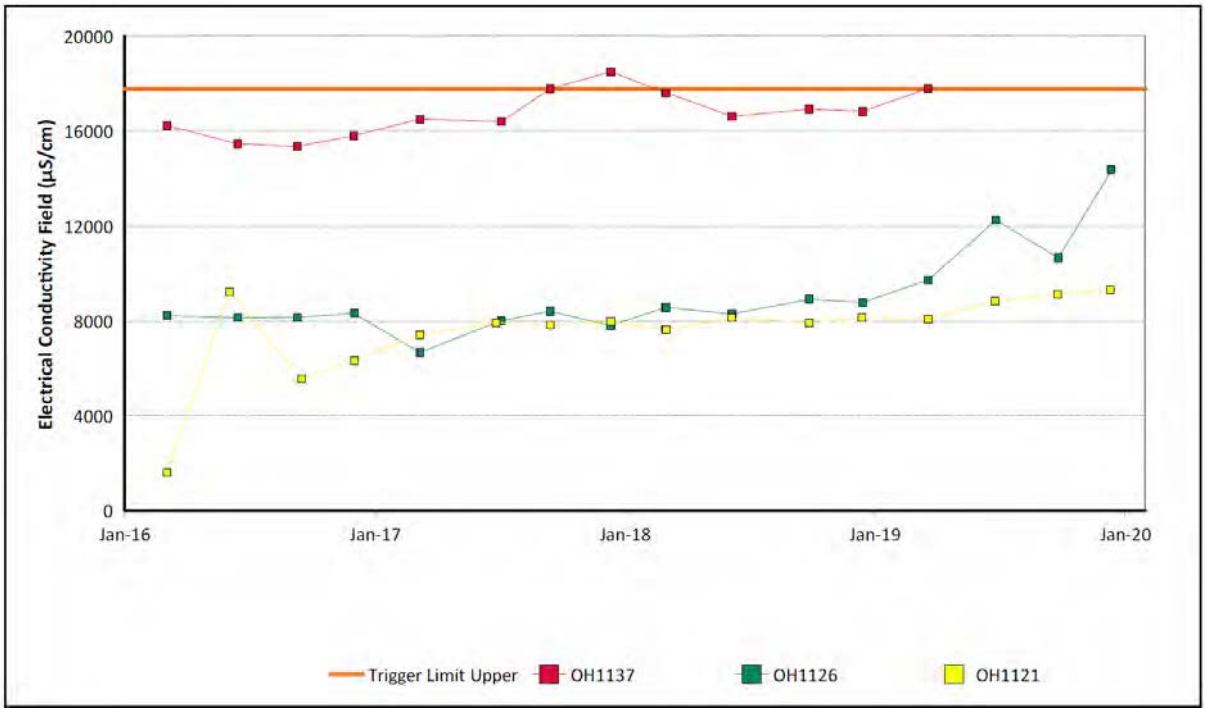
TABLE 6.23 VAUX SEAM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
OH1137	20/03/2019	**EC – 95th percentile**	Watching Brief* Note: Insufficient water volume recorded during sampling rounds in June and September 19. Continue to monitor.



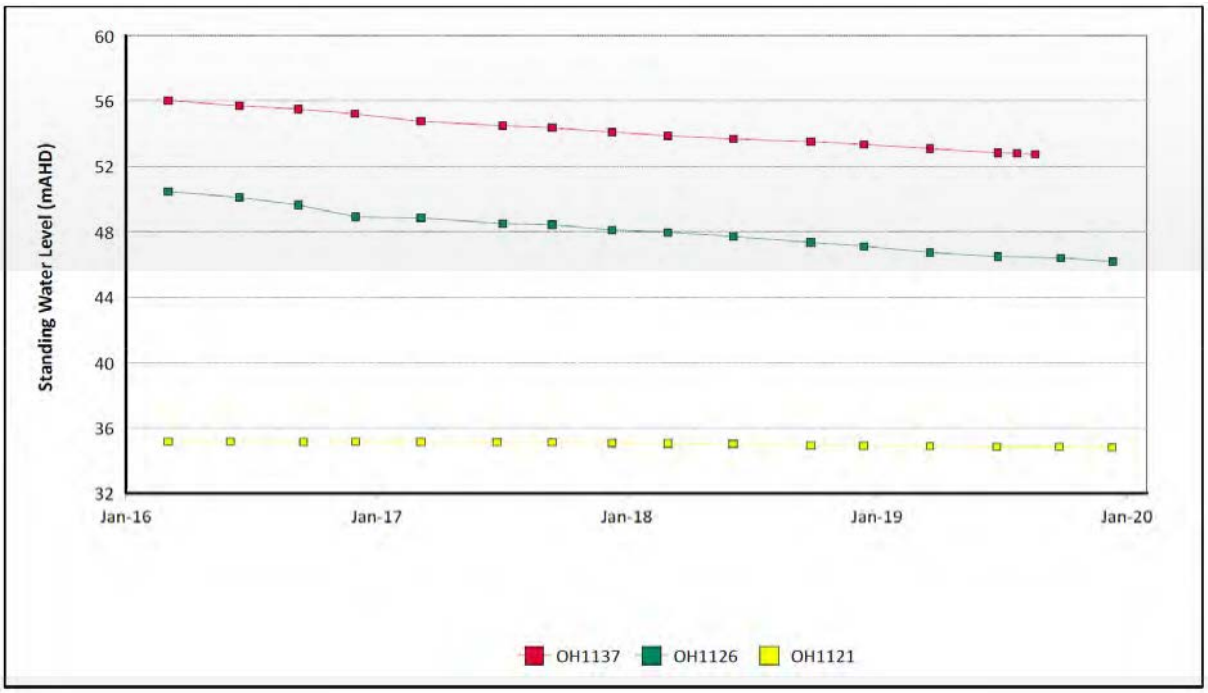
Note: Missing data indicates that there was insufficient water to take a sample.

FIGURE 59: VAUX SEAM GROUNDWATER PH TRENDS 2016 TO 2019



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

FIGURE 60: VAUX SEAM GROUNDWATER EC TRENDS 2016 TO 2019



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

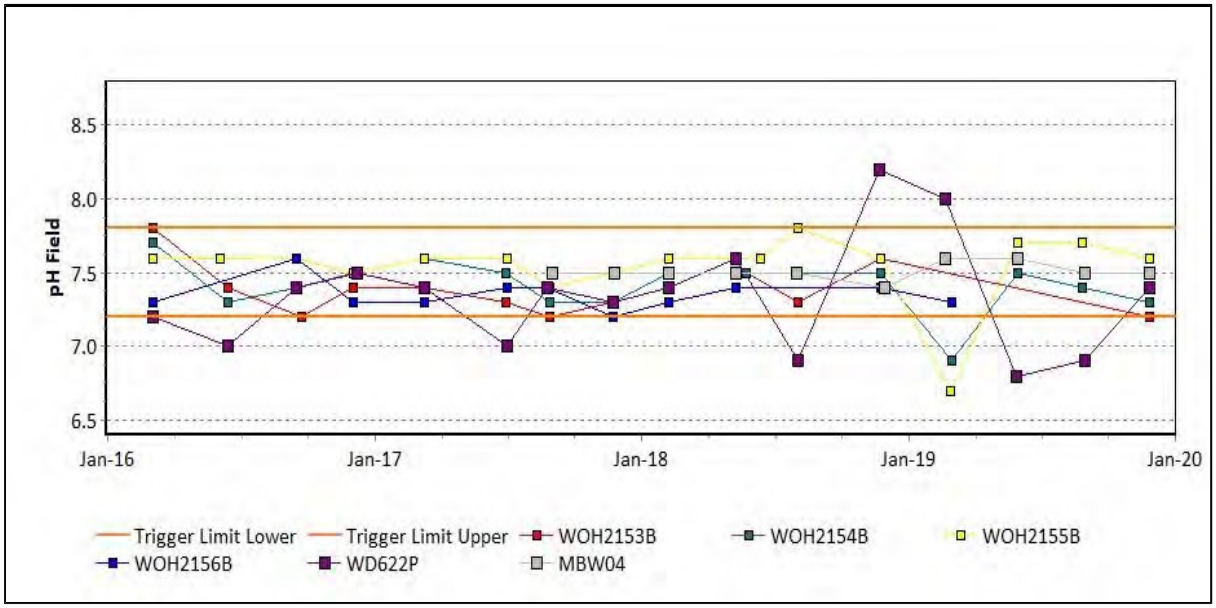
FIGURE 61: VAUX SEAM GROUNDWATER SWL TRENDS 2016 TO 2019

6.7.6.8 Wambo Seam Bores

Groundwater monitoring in the Wambo Seam was undertaken from six sites during 2019. A total of 18 samples were collected during the reporting period. The pH, EC and SWL trends for 2016 to 2019 for Wambo Seam groundwater bores are shown in **Figure 62, Figure 63** and **Figure 64** respectively. Over 2019 groundwater levels declined steadily in bores WOH2154B, WOH2153B, WOH2154B, WHO2155B and WOH2156B. WD622P showed an increased rate of drawdown. This bore is located less than 300m from the advancing West Pit highwall so this depressurisation is expected. Water quality results (with the exception of WD622P) were generally within trigger limits throughout the reporting period. WD622P experienced a declining trend in EC and an increasing trend in pH. It is likely that these water quality changes are a result of the reducing SWL at this location as a result of depressurisation from the open cut.

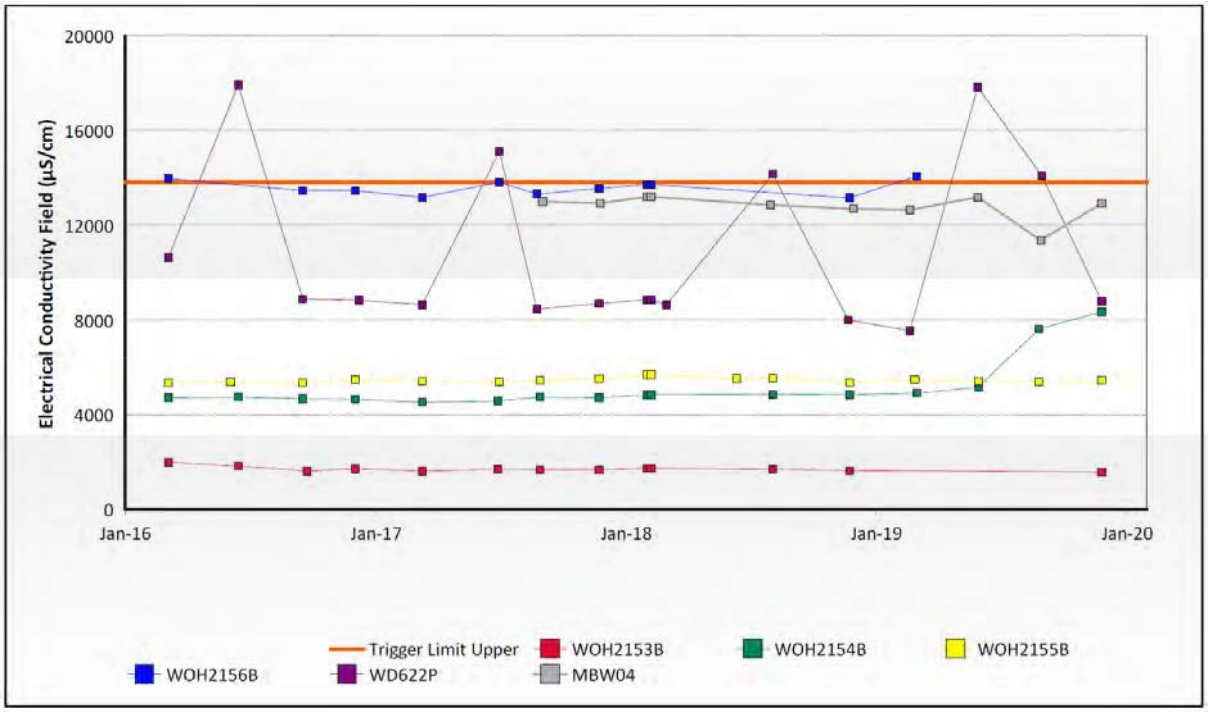
TABLE 6.24 MTW WAMBO SEAM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
WD622P	29/05/2019	**EC – 95th percentile**	Watching Brief* Note: Bore is located at edge of pre-strip area. Bore likely to influenced by active mining area.
	30/08/2019		
WD622P	19/02/2019	**pH – 95th percentile**	Watching Brief*
	29/05/2019	**pH – 5th percentile**	Watching Brief*
	30/08/2019		Investigation undertaken. Note: Fluctuating pH is considered to be attributable to coal seam depressurisation, as evidenced by historical trending of falling water level. This trend is consistent with the effects of nearby mining. Fluctuations also coincide with changes to the sampling methodology, from quarterly grab sampling to low flow pumping/purging prior to annual comprehensive sampling and analysis.
WOH2154B	01/03/2019	**pH – 5th percentile**	Watching Brief* Note: Monitoring result obtained in May 19 shows values back within trigger limits. No further action required.
WOH2155B	26/02/2019	**pH – 5th percentile**	Watching Brief* Note: Monitoring result obtained in May 19 shows values back within trigger limits. No further action required.
WOH2156B	01/03/2019	**EC – 95th Percentile**	Watching Brief* Note: Insufficient water volume recorded during sampling rounds in June and September 19.



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

FIGURE 62: WAMBO SEAM GROUNDWATER PH TRENDS 2016 TO 2019



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

FIGURE 63: WAMBO SEAM GROUNDWATER EC TRENDS 2016 TO 2019

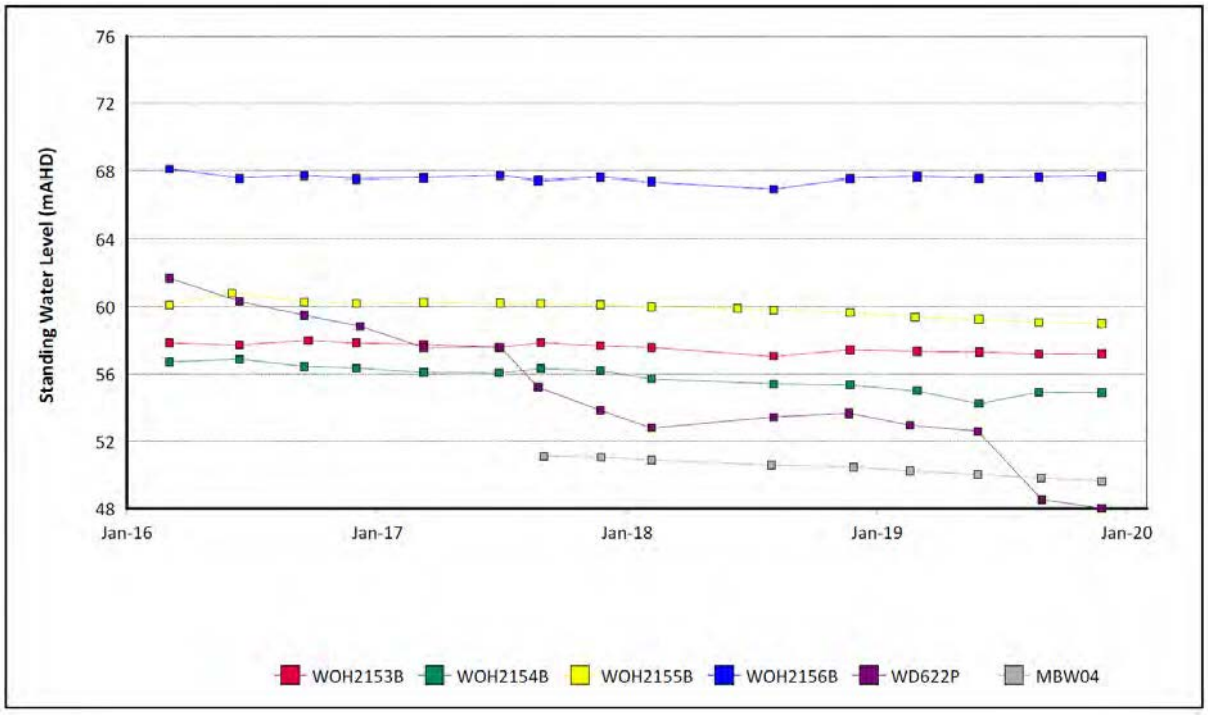


FIGURE 64: WAMBO SEAM GROUNDWATER SWL TRENDS 2016 TO 2019

6.7.6.9 Warkworth Seam Bores

Groundwater monitoring in the Warkworth Seam was undertaken from two sites during 2019; 24 samples were collected. The pH, EC and SWL trends for 2016 to 2019 for Warkworth seam bores are shown in

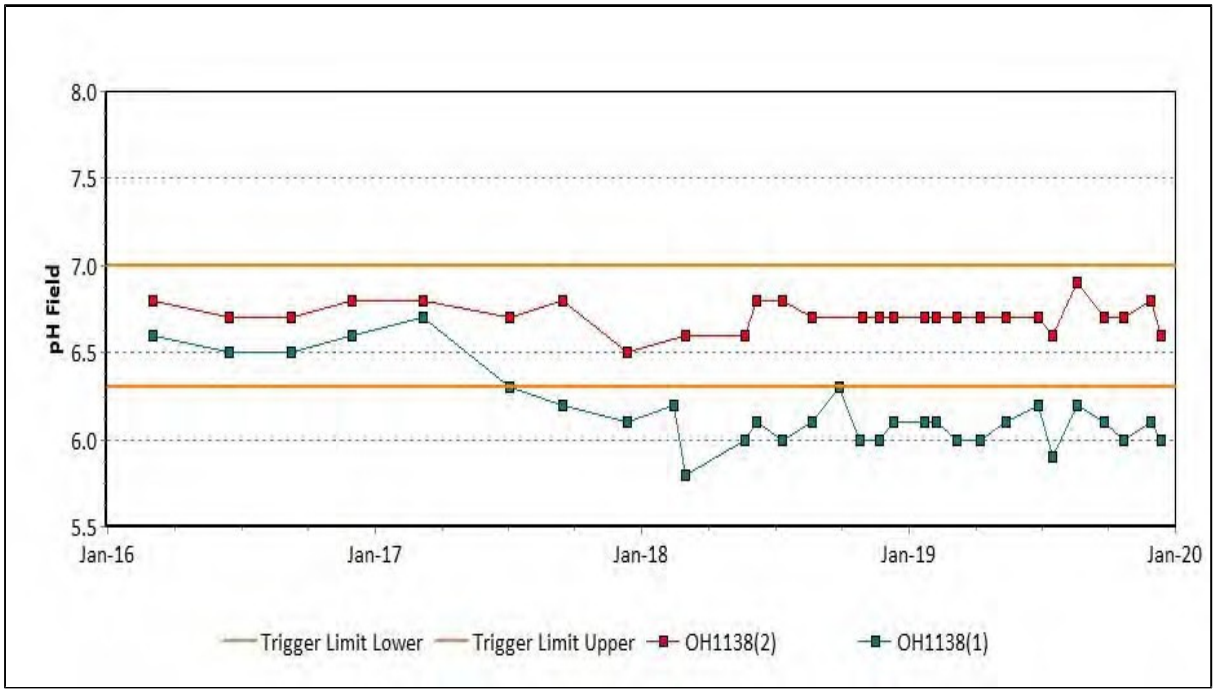


Figure 65, **Figure 66** and **Figure 67** respectively. The SWL in both bores reduced gradually over the reporting period in line with historical trends.

During the reporting period OH1138(1) exceeded trigger limits for declining pH and increasing EC. As outlined in **Appendix 4** it is expected that these results were most likely attributable to ongoing dry conditions. The decline may also be related to drawdown towards active mining within North Pit to the south-west as well as the new water quality sampling methodology and potential influences from the licenced abstraction of water from the LUG bore approximately 1.25km to the north-west .

TABLE 6.25 WARKWORTH SEAM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
OH1138(1)	22/01/2019 08/02/2019 08/03/2019 09/04/2019 14/05/2019 27/06/2019 16/07/2019 20/08/2019 26/09/2019 22/10/2019 27/11/2019 13/12/2019	**pH – 5th percentile**	Watching Brief* Note: pH values consistent with results obtained at this location since 2017. Continue to monitor on increased frequency.
OH1138(1)	09/04/2019 14/05/2019	**EC – 95th percentile**	Watching Brief* Note: Monitoring result obtained in June 19 shows values back within trigger limits.

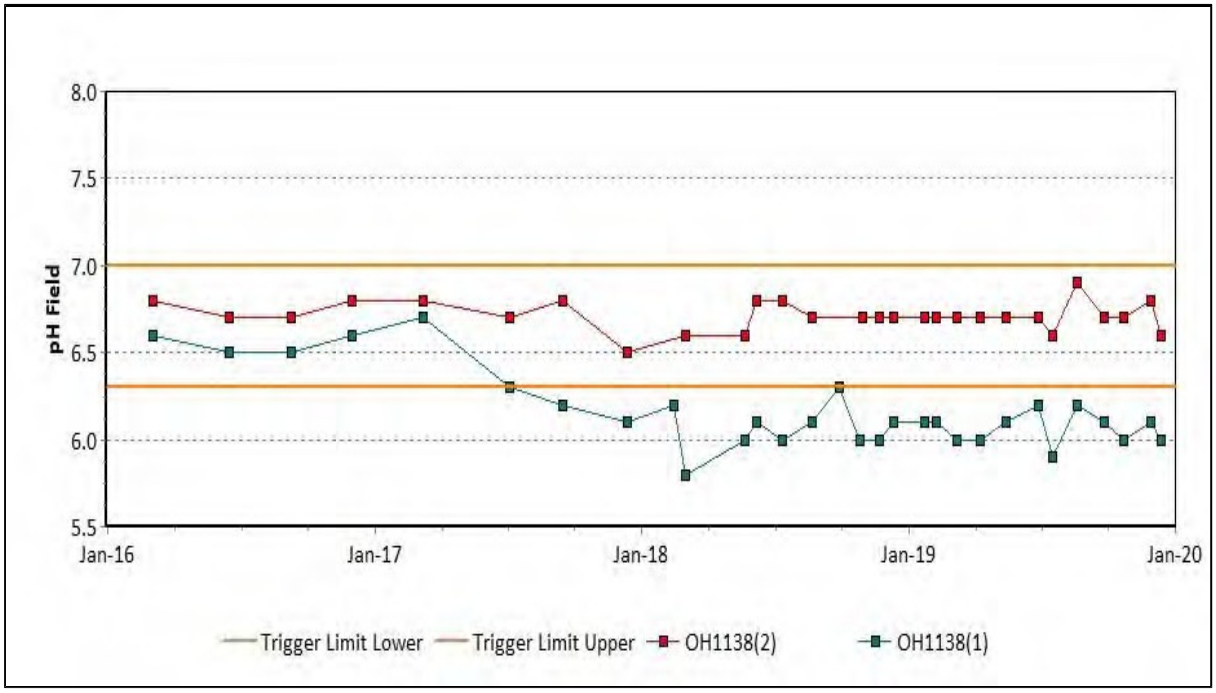


FIGURE 65: WARKWORTH SEAM GROUNDWATER PH TRENDS 2016 TO 2019

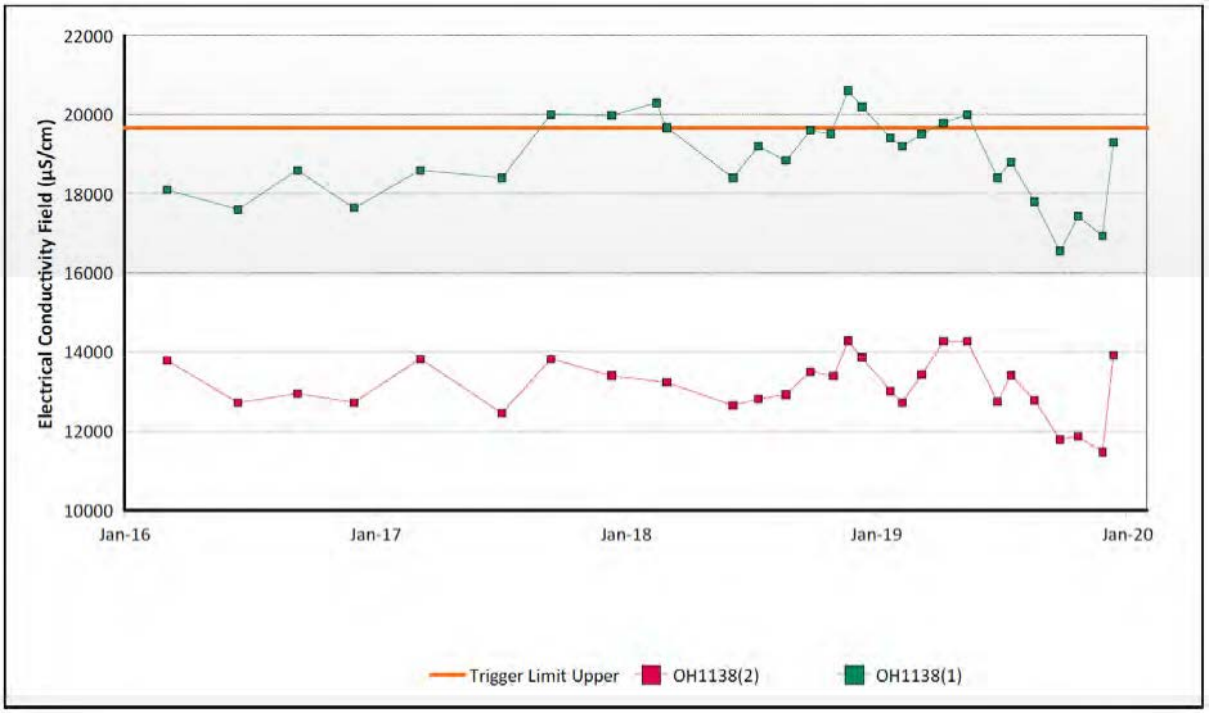


FIGURE 66: WARKWORTH SEAM GROUNDWATER EC TRENDS 2016 TO 2019

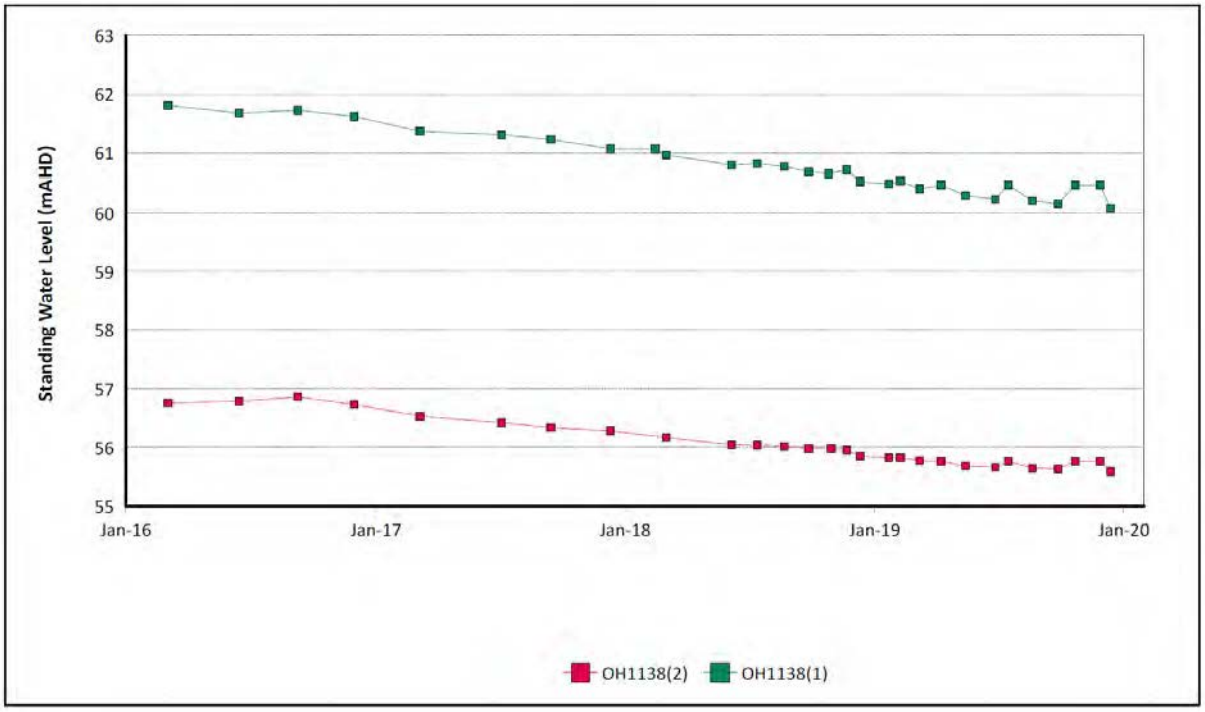


FIGURE 67: WARKWORTH SEAM GROUNDWATER SWL TRENDS 2016 TO 2019

6.7.6.10 Wollombi Brook Alluvium Bores

Groundwater monitoring in the Wollombi Brook Alluvium was undertaken from two sites during 2019; five samples were collected. The pH, EC and SWL trends for 2016 to 2019 are shown in **Figure 68** to **Figure 72** respectively. **Table 6.26** shows the Trigger summary.

Over 2019 the SWL in both bores declined in line with historical trends. The decline in water levels corresponds to the stream flow levels in the Wollombi Brook as a result is decreased rainfall over the period which has resulted in losing conditions. 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 6.26 WOLLOMBI BROOK ALLUVIUM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
PZ8S	10/12/2019	**pH – 5th Percentile**	Watching Brief*

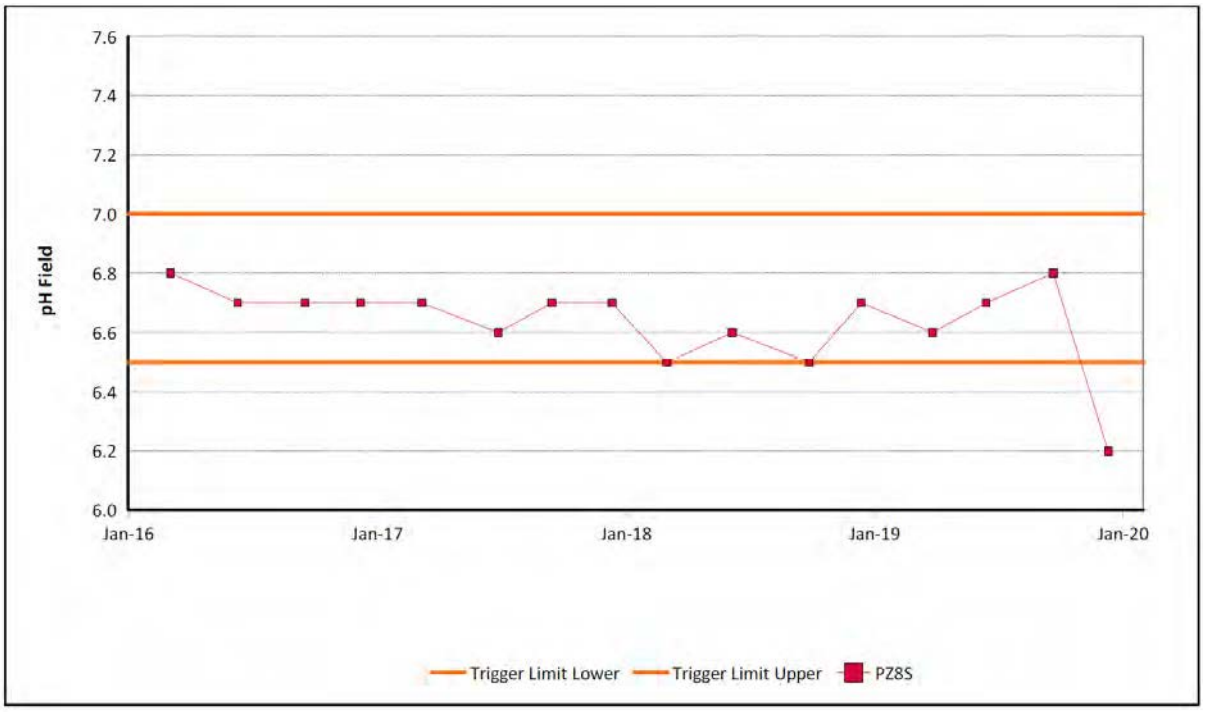


FIGURE 68: WOLLOMBI BROOK ALLUVIUM GROUNDWATER PH TRENDS 2016 TO 2019

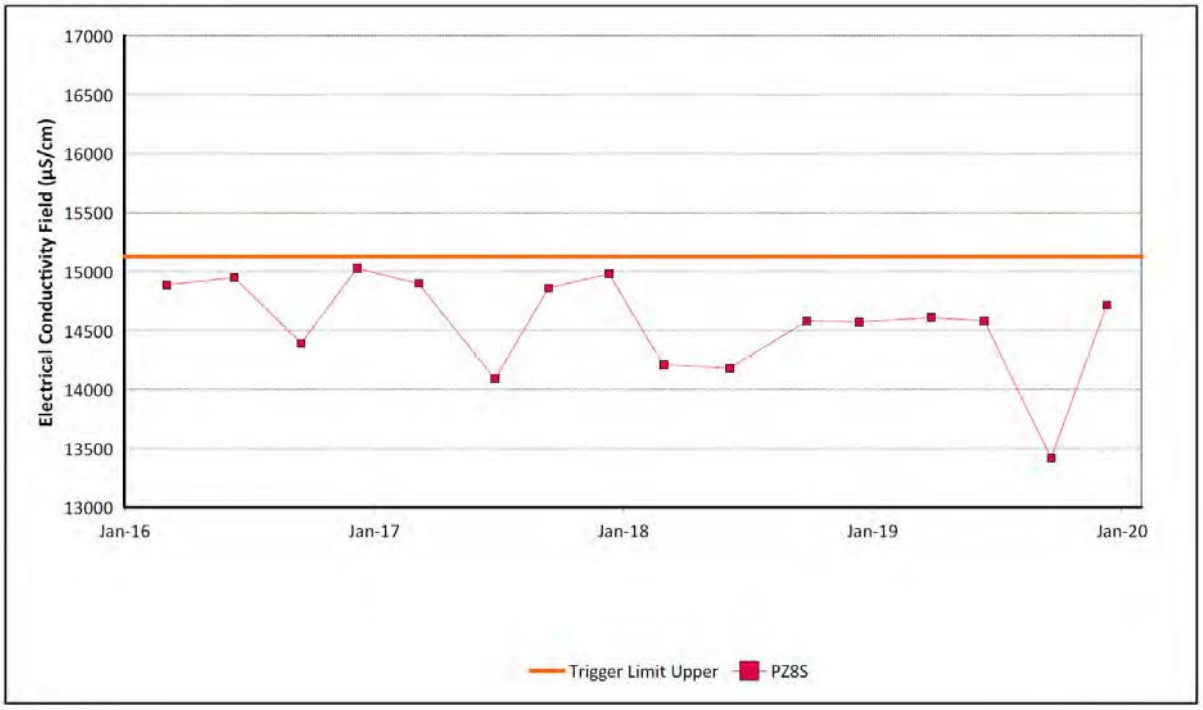
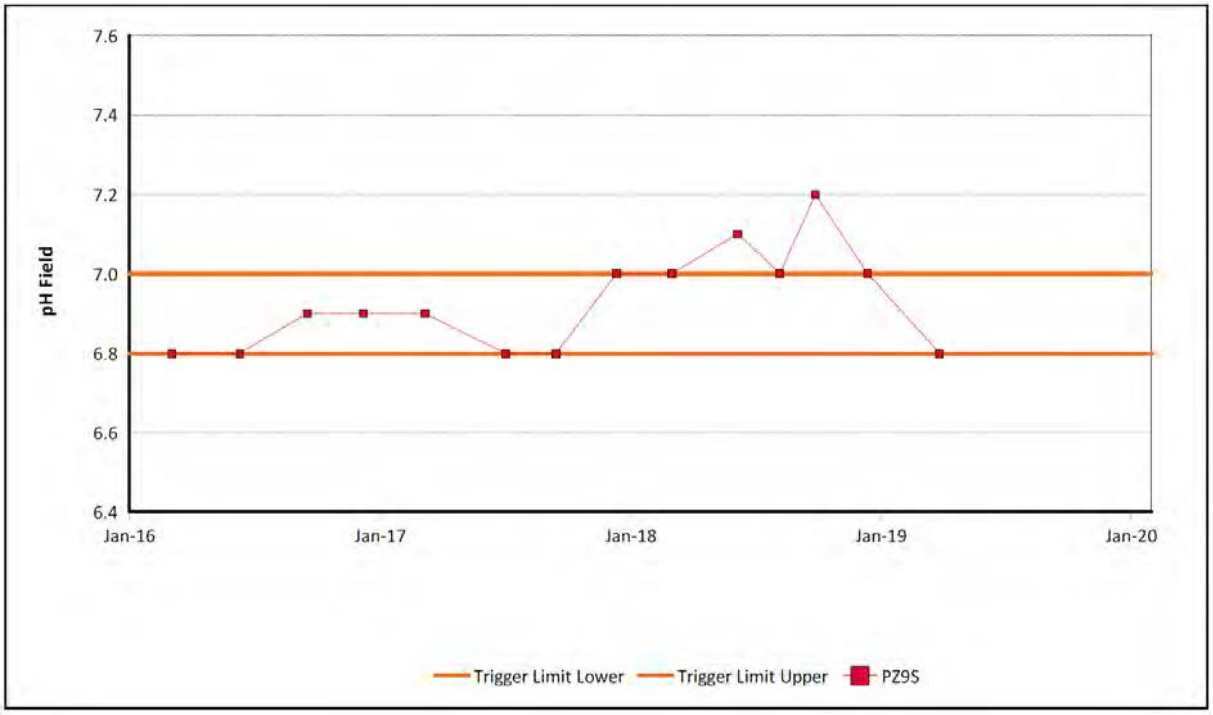
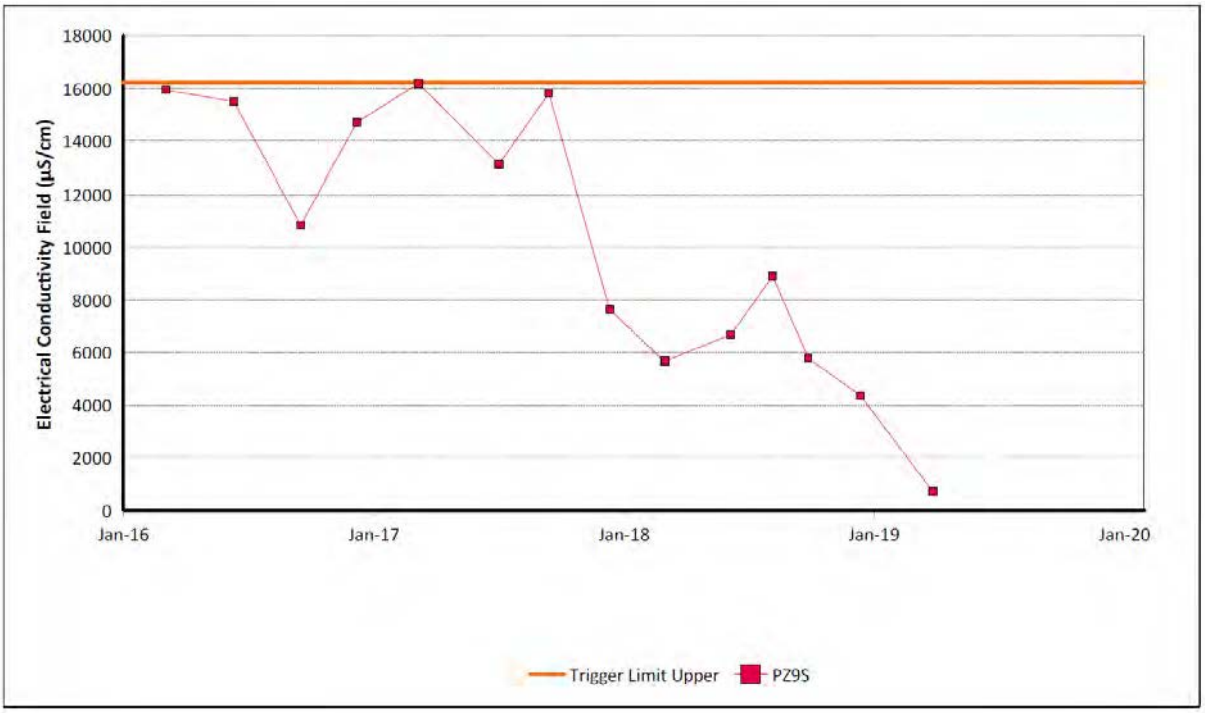


FIGURE 69: WOLLOMBI BROOK ALLUVIUM GROUNDWATER EC TRENDS 2016 TO 2019



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

FIGURE 70: WOLLOMBI BROOK ALLUVIUM GROUNDWATER PH TRENDS 2016 TO 2019



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

FIGURE 71: WOLLOMBI BROOK ALLUVIUM GROUNDWATER EC TRENDS 2016 TO 2019

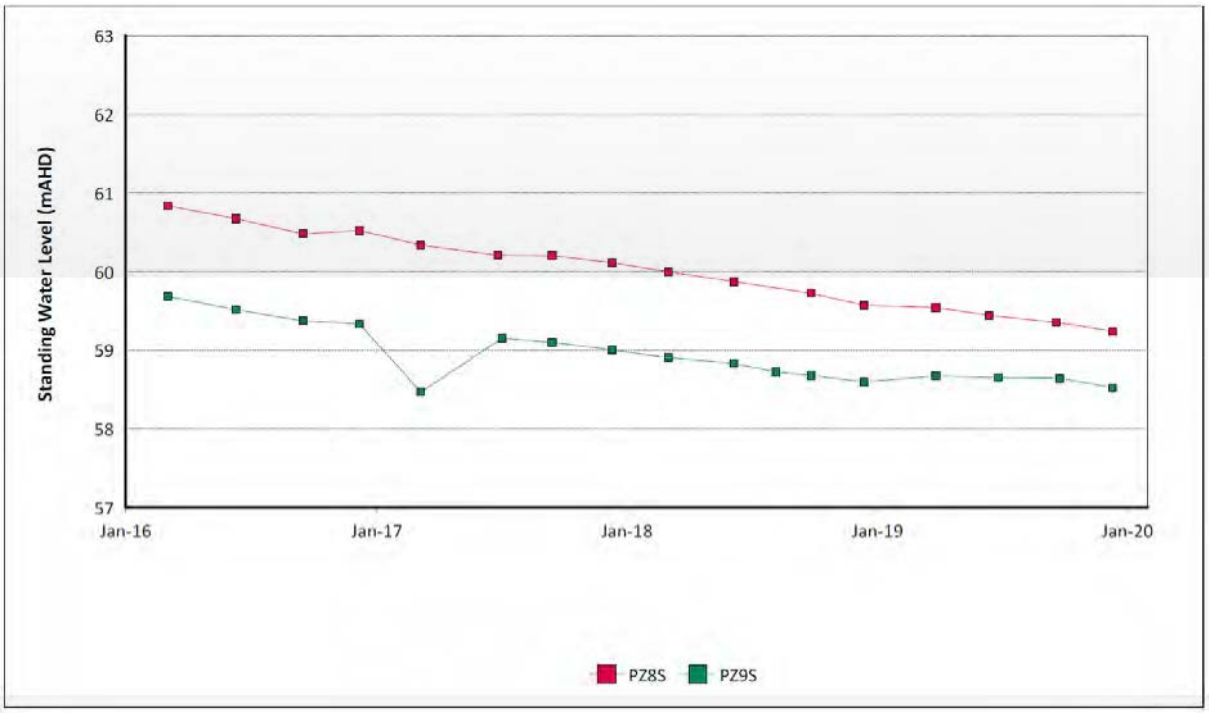


FIGURE 72: WOLLOMBI BROOK ALLUVIUM GROUNDWATER SWL TRENDS 2016 TO 2019

6.7.6.11 Woodlands Hill Seam Bores

Groundwater monitoring in the Woodlands Hill Seam was undertaken from one site during 2019; four samples were collected. The pH, EC and SWL trends for 2016 to 2019 are shown in **Figure 73** to **Figure 75** respectively. **Table 6.27** shows the Trigger Point summary. 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.

TABLE 6.27 WOODLANDS HILL SEAM GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
WD625P	01/03/2019	**EC – 95th Percentile**	Watching Brief* Note: Monitoring result obtained in May 19 shows values back within trigger limits.
	30/08/2019		Watching Brief*
WD625P	01/03/2019	**pH – 5th Percentile**	Watching Brief*
	31/05/2019		Watching Brief* Note: Monitoring result obtained in May 19 shows values back within trigger limits. No further action required.

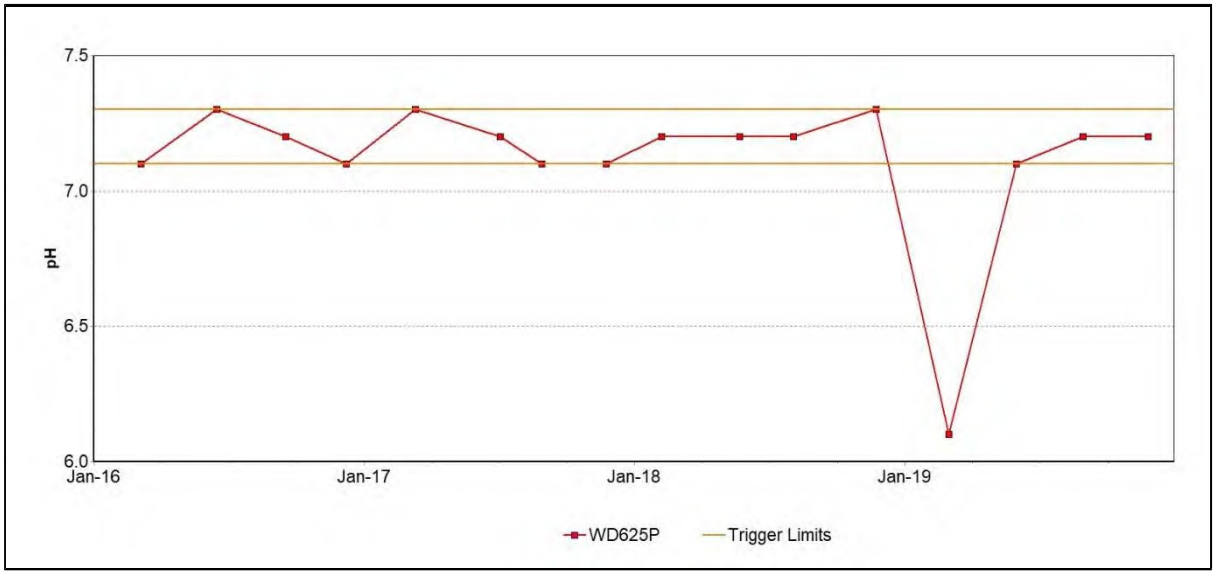


FIGURE 73: WOODLANDS HILL SEAM GROUNDWATER PH TRENDS 2016 TO 2019

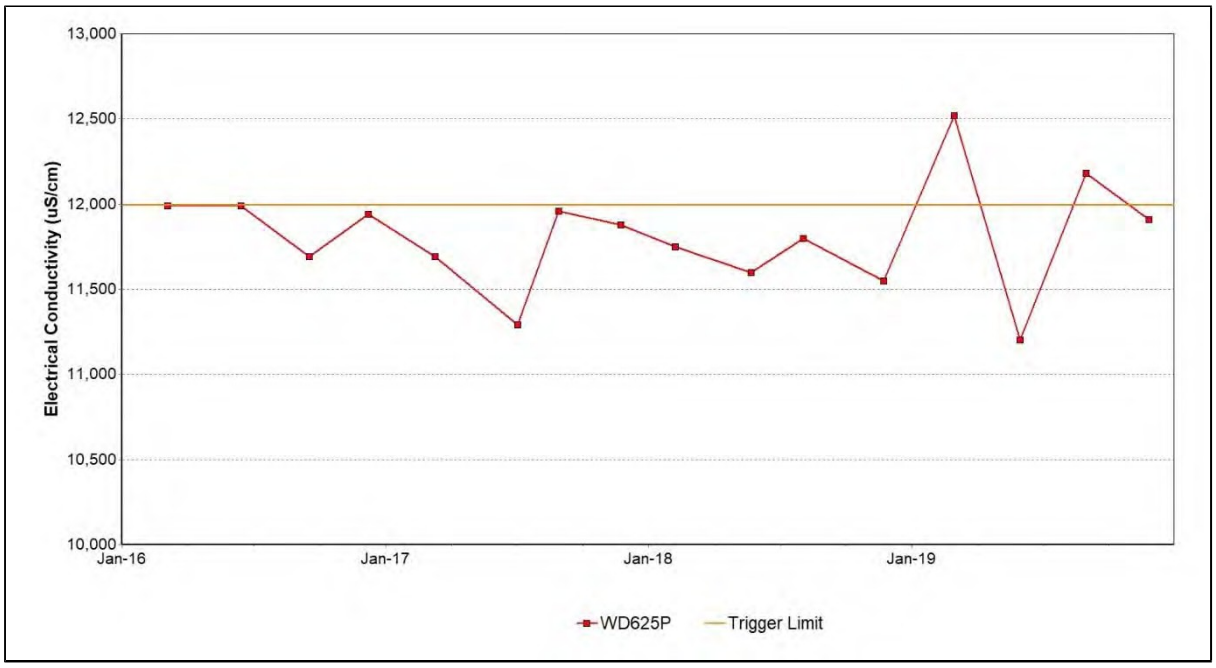


FIGURE 74: WOODLANDS HILL SEAM GROUNDWATER EC TRENDS 2016 TO 2019

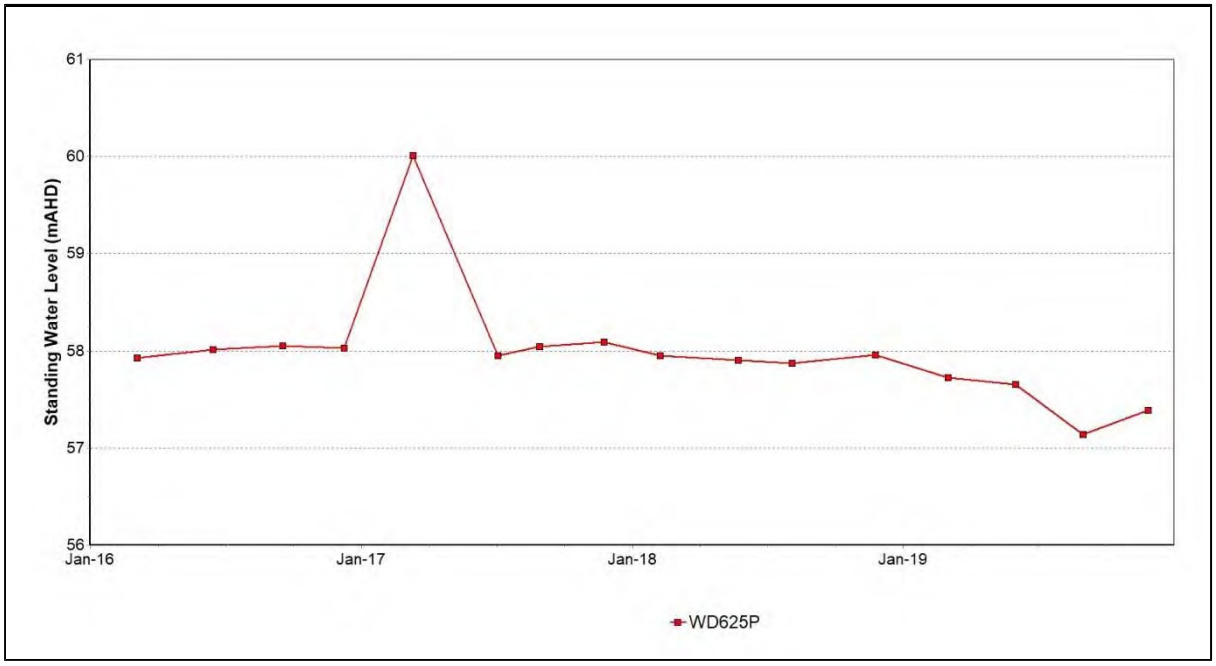


FIGURE 75: WOODLANDS HILL SEAM GROUNDWATER SWL TRENDS 2016 TO 2019

6.7.6.12 Aeolian Warkworth Sands

Groundwater monitoring in the Aeolian Warkworth Sands was undertaken from one site during 2019; a total of four samples were collected. The pH, EC and SWL trends for 2016 to 2019 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. This decline corresponds with the declining CRD trends however, the logger data does not show a response to the above average rainfall experienced in March 2019. Further investigation into the local ground conditions, condition of the nested bore and functionality of the bore loggers should be undertaken, to understand the interaction between the two bore depths. It is also noted that 2019 was the driest year on record from the sites weather station.

TABLE 6.28 AEOLIAN WARKWORTH SANDS GROUNDWATER 2019 INTERNAL TRIGGER TRACKING

Location	Date	Trigger limit	Action taken in response
PZ7S	27/08/2019	**pH – 5th Percentile**	Watching Brief*

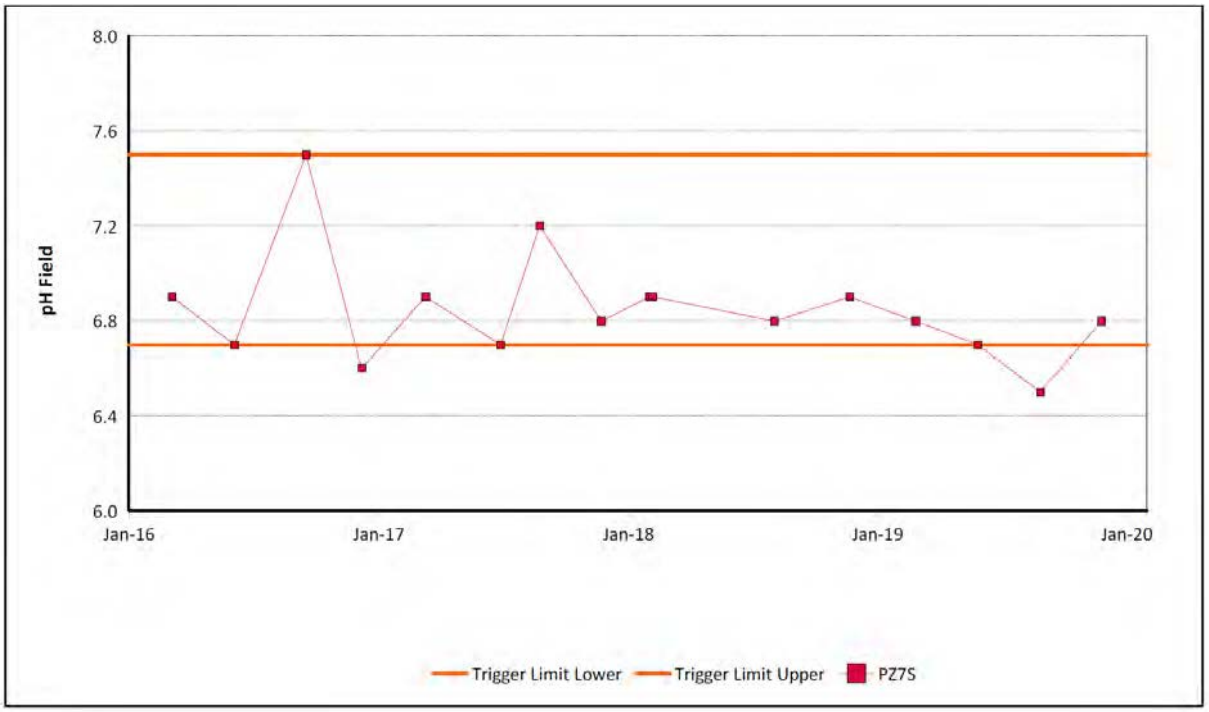


FIGURE 76: AEOLIAN WARKWORTH SANDS GROUNDWATER PH TRENDS 2016 TO 2019

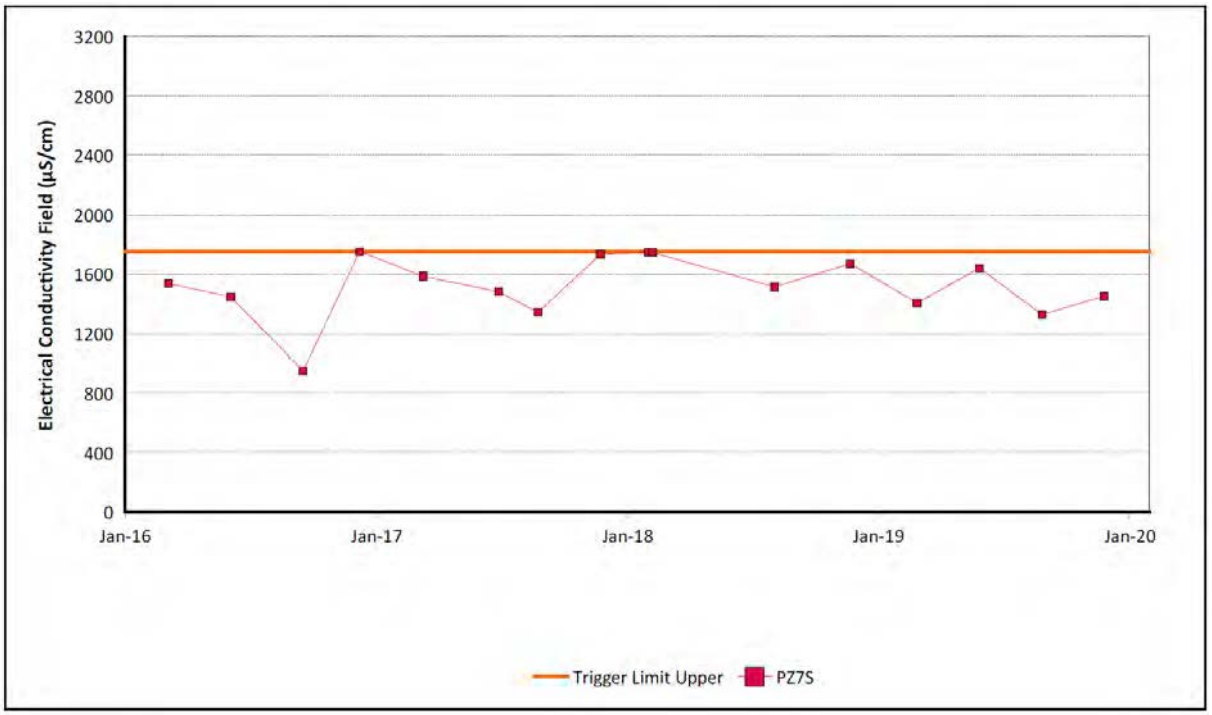


FIGURE 77: AEOLIAN WARKWORTH SANDS GROUNDWATER EC TRENDS 2016 TO 2019

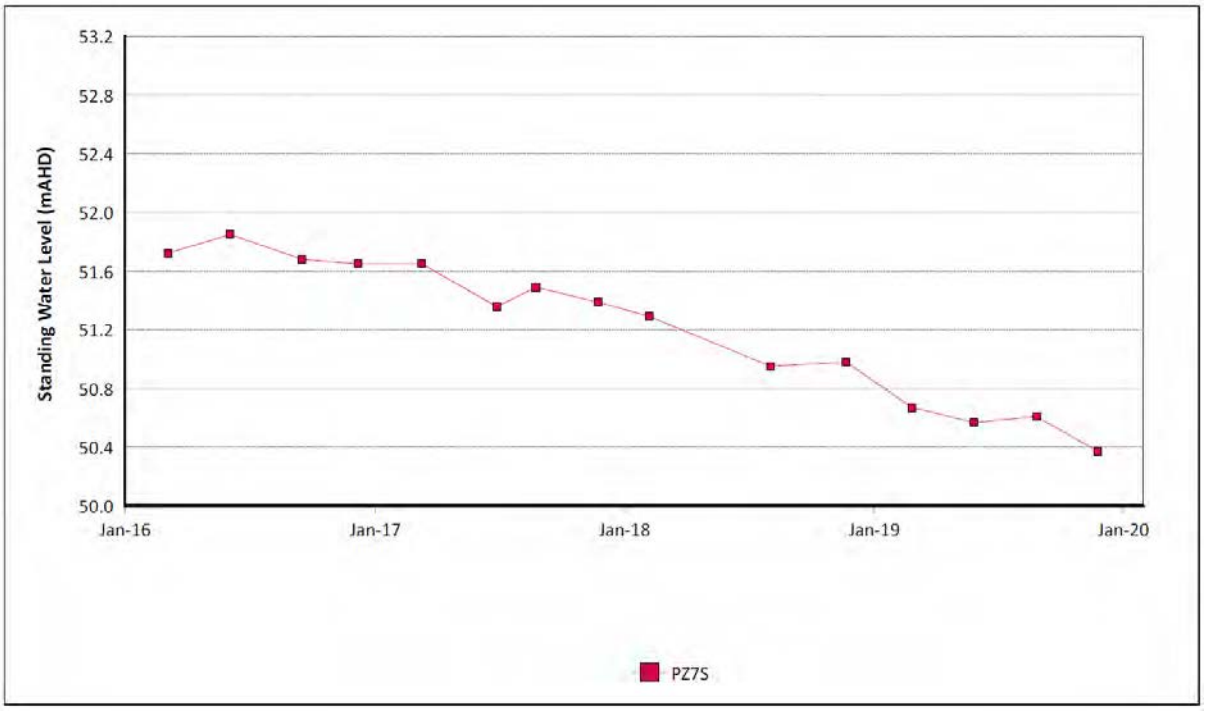


FIGURE 78: AEOLIAN WARKWORTH SANDS GROUNDWATER SWL TRENDS 2016 TO 2019

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 2019 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 declined slightly, generally in line with climate and stream flow trends. Groundwater within the Permian coal measures remained relatively stable to slightly declining over 2019. Where observed, the decreasing elevations are believed to be attributed to depressurisation of the coal seams in relation to mining activities as well as below average rainfall. The groundwater drawdown appears to be 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 2019 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 2019. It was identified that several bores exceeded triggers for EC and pH; however, 2019 readings were 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 abstraction from the LUG Bore at Hunter Valley Operations to the north and the progression of mining activities associated with North Pit. Groundwater levels within the Warkworth Sands at PZ7S declined over the 2019, despite above average rainfall recorded in March 2019, similar to trends observed for bores in overburden. It is however noted that this

decline is in line with the dry climatic conditions. Further investigation into the ground conditions, bore construction and logger at PZ7S and PZ7D is recommended.

- Over 2019 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 2019 reporting year the total take under the Hunter Regulated water source was estimated at 1,597.5 ML. Total take from Hunter Unregulated water source was estimated at 11 ML and 270 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 2019. 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. This will include newly installed monitoring points and removal of bores/sensors from the program that have been identified as destroyed/erroneous;

- Check surveyed ground and casing elevations for bores, particularly the MB15MTW bores;
- Check VWP's and monitoring bore loggers are working correctly (i.e. check/replace batteries and logger depths) and install a site barometric logger for atmospheric compensation;
- Review of logger installation depths for bores PZ8D, PZ9S, PZ7S, PZ7D and MB15MTW02S. Review required to confirm that the reported installation depths are correct and to ensure loggers are suitably placed below the standing water level;
- Investigate ground conditions, bore construction and logger data for the Warkworth Sands and trends observed at bore PZ7S and PZ7D;
- Installation of data loggers within bores MB15MTW02D and PZ8S;
- Review geological and bore construction logs for bores OH943, OH944, OH788 and OH1121;
- Review site conditions around MTD616P and MTD614 to understand cause for rise in groundwater levels within shallow stratigraphy;
- Review of groundwater quality triggers to ensure they are reasonable and adequately capture historical trends for bores and account for changing climate conditions; and
- Update the site numerical groundwater model to account for climate trends, LUG bore abstraction and actual mine progression that have evolved since the initial model development

MTW modified its ground water quality sampling methodology for the 2019 reporting period as a direct result of the findings/recommendations outlined in the 2018 annual groundwater review. MTW now utilises a purging technique for the water quality sampling (where possible) rather than grab samples each quarter which has been undertaken historically.

In addition, MTW undertook a review of the trigger limits associated with MTW's groundwater monitoring bore network to better reflect individual bore trends. The updated trigger limits have been included within an updated Water Management Plan which was submitted to DPIE on 20 December 2019 for endorsement. Tracking against the revised trigger limits will be undertaken once the management plan has been endorsed.

7 REHABILITATION

7.1 Summary of Rehabilitation

A total of 82.7 ha of rehabilitation was undertaken during 2019 against a Mining Operations Plan (MOP) target of 82.1 ha.

Total disturbance undertaken during 2019 was 99.7 ha, which was higher than the MOP projection of 79.2 ha. The disturbance during 2019 was made up of 63.7 ha of new disturbance and 36.0 ha of disturbance of previously rehabilitated area.

TABLE 7.1 KEY REHABILITATION PERFORMANCE INDICATORS

Mine Area Type	Previous Reporting Period (Actual) Year 2018 (ha)	This Reporting Period (Actual) Year 2019 (ha)	Next Reporting Period (Forecast) Year 2020 (ha)
A. Total mine footprint[1]	3,879.6	3,881.2	3931.2
B. Total Active Disturbance[2]	2,546.5	2,579.8	2,584.9
C. Land being prepared for rehabilitation[3]	97.4	159.1	70
D. Land under active rehabilitation[4]	1,235.7	1142.3	1276.3
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 – Growing Media 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.

Ecologists from Niche Environment and Heritage commenced monitoring of rehabilitated land returned to native vegetation in 2015. The results of monitoring conducted in early and mid-2017 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 26 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.

The latest round of rehabilitation monitoring was conducted by Cumberland Plain Seeds in Autumn 2019, the results of this rehabilitation monitoring are presented in **Appendix 5** of this 2019 AER. The move to Autumn monitoring is to coincide with the flowering time for the bulk of the native grasses to make it easier to identify the native understorey species and therefore provide a more accurate and transparent assessment of the rehabilitation program. The 2019 monitoring program has established an additional 24 new monitoring sites at MTW.

Additional monitoring methods were incorporated into the 2017 program to measure the density, health and growth of canopy species. Sites have been selected to include rehabilitation of varying ages and different rehabilitation methods.

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 trialled in 2019 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 2019 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 has not been able to recommence during 2019 as geotechnical studies undertaken by Australian Tailings Consultants have determined that the tailings strength has not increased sufficiently to support the capping process. During the reporting period mine equipment has been able to complete capping on some areas where the Stage 1 capping had been finished. This has resulted in 2.2ha of rehabilitation being completed on the Tailings Dam 2 footprint. The other focus of activity during 2019 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 recommence.

7.3 Rehabilitation Performance

Table 7.2 summarises actual rehabilitation and disturbance completed compared with the rehabilitation commitments in the MTW MOP. **Appendix 6** provides the Annual Rehabilitation Report Form, including rehabilitation progress for each domain through the rehabilitation phases.

The area of rehabilitation that was sown during the reporting period was 0.6ha above the MOP target for MTW. The area of rehabilitation disturbance however was more than the MOP target for MTW by 30.6ha, leading to a net rehabilitation result for 2019 that was 30.0ha behind the MOP commitment. The additional rehabilitation disturbance during 2019 was attributable to the re-classification of topsoil stockpiles in rehabilitation areas, that had been reported as rehabilitation, being re-classified as disturbed areas. The net rehabilitation result over the MOP period (2015 to 2019) is 347.8ha versus a MOP commitment of 383.4ha, lagging by 35.6ha.

The amount of new disturbance undertaken in 2018 was 10.1ha lower than the MOP projections. The cumulative new disturbance over the period of the current MOP is also 10.6ha lower than the projected disturbance.

The 2019 rehabilitation areas for MTW are shown in **Appendix 7.**

TABLE 7.2 REHABILITATION AND DISTURBANCE COMPLETED IN 2019

MOP	Pit Area	2019 Totals (ha)		Cumulative Totals During MOP Period* (ha)	
		Actual	MOP Commitment	Actual	MOP Commitment
Rehabilitation					
MTW	Mt Thorley	38.9	44.3	115.9	159.8
	Warkworth	43.8	37.8	270.8	319.5
	MTW Total	**82.7**	**82.1**	**469.4**	**479.3**
Rehabilitation Disturbance					
MTW	Mt Thorley	14.7	2.1	52.8	38.4
	Warkworth	21.3	3.3	68.8	57.5
	MTW Total	**36.0**	**5.4**	**121.6**	**95.9**
New Disturbance					
MTW	Mt Thorley	6.0	5.4	27.0	59.6
	Warkworth	57.7	68.4	350.9	328.9
	MTW Total	**63.7**	**73.8**	**377.9**	**388.5**
Net Rehabilitation (Rehabilitation minus Rehabilitation Disturbance)					

MTW	Mt Thorley	24.2	42.2	102.0	121.4
	Warkworth	22.5	34.5	245.8	262.0
	MTW Total	**46.7**	**76.7**	**347.8**	**383.4**

Note: Rehabilitation areas relate to areas at or past the phase of Ecosystem and Landuse Establishment.
** MOP Period is 2015 - 2021*

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 1,282 hectares of rehabilitation completed across MTW, 179ha ahead of the EIS forecast for the end of 2017 and tracking well to achieve the forecast total rehabilitation area at the end of 2023.

7.4 Rehabilitation Programme Variations

An independent assessment was conducted in 2019 to assess the current status of active rehabilitation across the MTW site in response to two Notices of Direction issued by the NSW Resources Regulator on 5 July 2019. The project resulted in 1,067ha being classified in Ecosystem and Land Use Establishment phase and 140ha in the Growth Medium phase. No areas were deemed to have met the criteria for Ecosystem and Land Use Development phase, however some areas were tracking towards this phase and could achieve this phase in time with appropriate management. This represents a significant change in the classification of active rehabilitation at MTW with last year's AER reporting 1,067ha of rehabilitation in the Ecosystem and Land Use Development phase.
The change in rehabilitation classification has been reflected in this AER and will be incorporated in a MOP Amendment to be submitted to Resources Regulator by 31 March 2020.

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 was to be undertaken during 2019 to determine the relative effects of the various soil ameliorants but will be postponed until 2020 due to the continuing dry conditions experienced at MTW.

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 the reporting period. 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 will be monitored in 2020 to determine the efficacy of the reduced application rates.

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 2019 areas totalling 286.8ha 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 2019 areas totalling 171.5ha were treated using selective weed

control methods (i.e. backpack spray, Quikspray). The area of selective weed control increased significantly in 2019 (up from 37ha in 2018) 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 2019 are shown in **Figure 79** below. Note some areas may have received a combination of treatments during the reporting period.

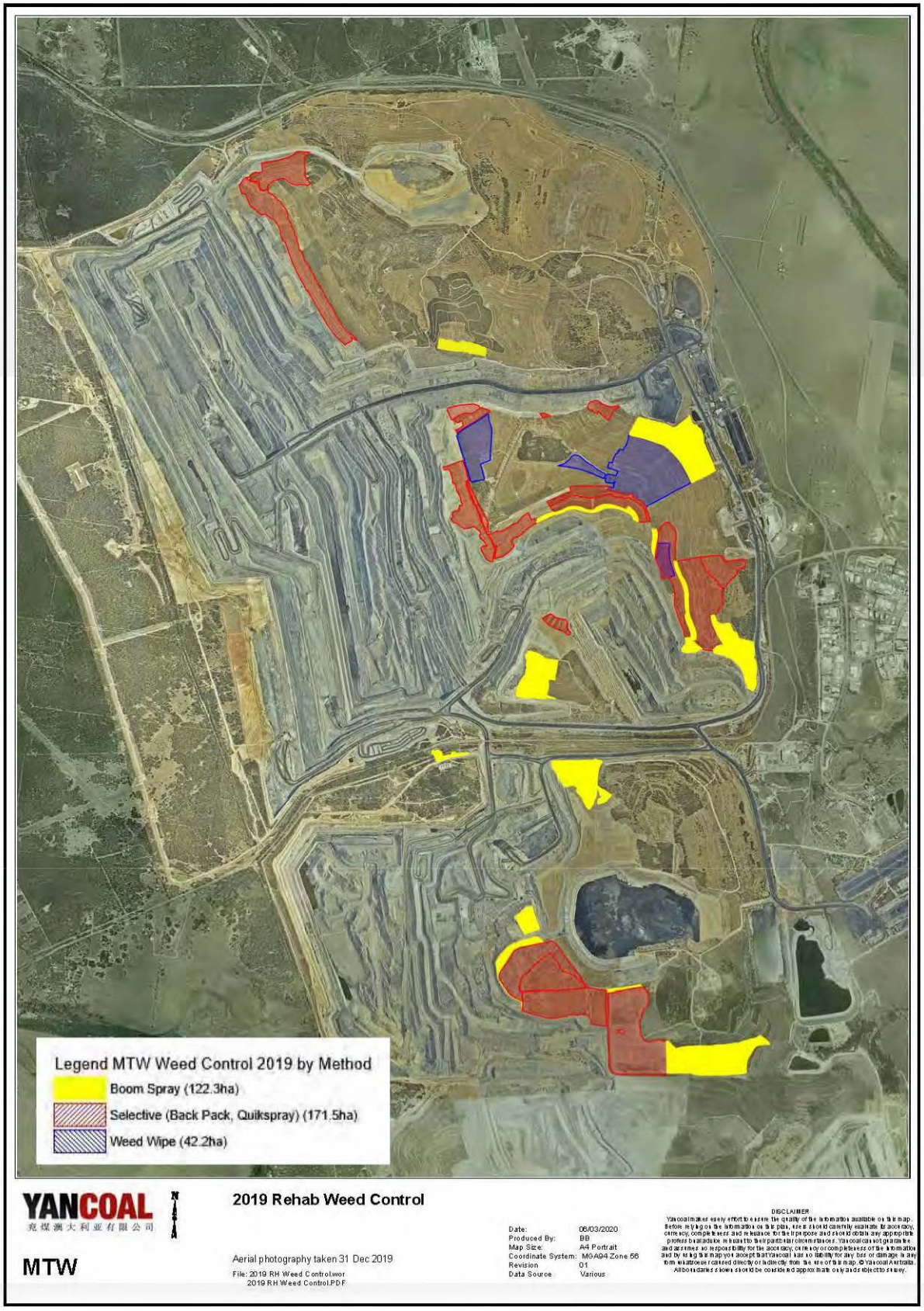


FIGURE 79: 2019 REHABILITATION WEED CONTROL LOCATIONS

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 2019. There was 68.5 ha of rehabilitation top soiled during 2019, 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)
68,500	40,030	660,357	688,826

7.8 Tailings Management

Detail of capping activities on tailings storage facilities at MTW is covered in **Appendix 6**. 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	Diesel Pump in place
Interim TSF	Inactive	Floating solar pump installed
Ministrip TSF	Inactive	Diesel Pump in place, pumping as required

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 87 days of weed management work was undertaken on site at MTW during 2019, with 230 ha of land treated, including maintenance of access tracks and 18 environmental monitoring points. The weeds targeted during the 2019 weed

management programme were based on the results of the 2018 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)*
- Galenia *(Galenia pubescens)*
- Green cestrum *(Cestrum parqui)*
- Lantana *(Lantana Camara)*
- Mother of millions *(Bryophyllum delagoense)*
- Opuntia (Pear) species (Tiger, Prickly and Creeping Pear)
- Saligna *(Acacia saligna)*
- Various grasses (Various spp)

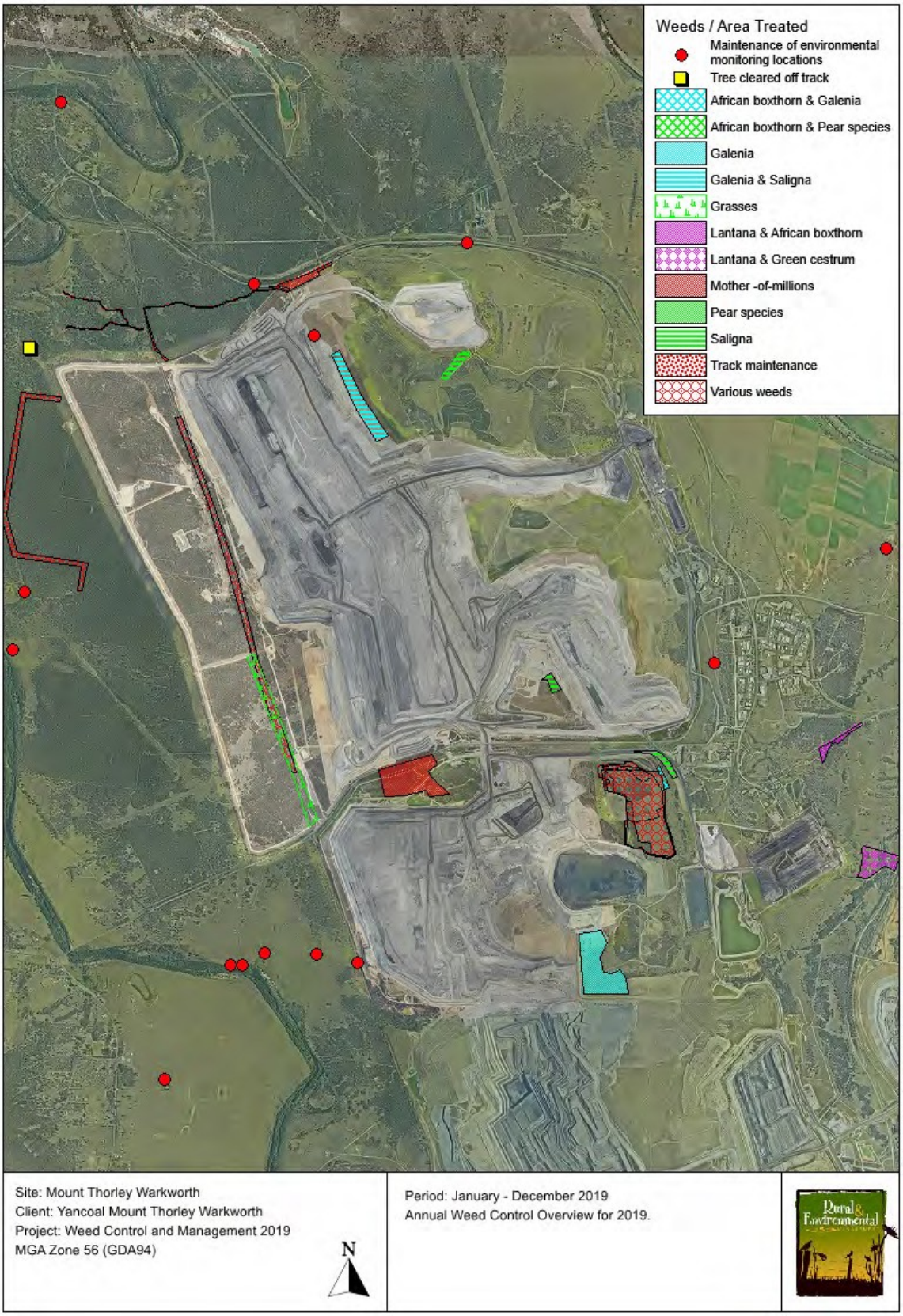


FIGURE 80: ANNUAL WEED CONTROL OVERVIEW FOR 2018

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 2019, 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

Thirteen 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
- 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 - Asset protection
- Saffron thistle *(Cartharmus lanatus)* General biosecurity duty
- 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)*
- Spiny Rush (Juncas acutus)
- Tree Tobacco (Nicotiana glauca)
- Wild Rose *(Rosa sp)*

Species identified during the 2019 survey will form the basis of ongoing weed management works during 2020.

7.10 Vertebrate Pest Management

As part of MTW's Vertebrate Pest Action Plan a baiting programme is carried out on a seasonal basis. Three 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.

Table 7.6 summarises the results from the programmes carried out at MTW during 2019 with baiting locations and results for the programmes are illustrated in **Figure 81** to **Figure 82**.

TABLE 7.6 VERTEBRATE PEST CONTROL SUMMARY

Season	1080 Baiting				Shooting		
	Total Lethal Baits Laid	Takes by Wild Dog	Takes by Fox	Takes by Feral Pigs	Feral Pigs	Hares	Foxes
Autumn	120	38	9	10	6	27	2
Spring	119	63	3	-	3	-	-
Total	**239**	**101**	**12**	**10**	**9**	**27**	**2**

Additional pest management programmes included:

- Feral pig 1080 baiting program carried out across MTW in autumn: 10 feral pigs poisoned.
- A cat trap was set in the North mining muster area in summer; one female cat and two kittens were trapped over a four-day period and euthanised at the local veterinary clinic.
- Opportunistic shooting of vertebrate pests.

MTW will continue to carry out quarterly vertebrate pest control programmes during 2020 to limit feral pest impacts on landholdings and surrounding neighbours.

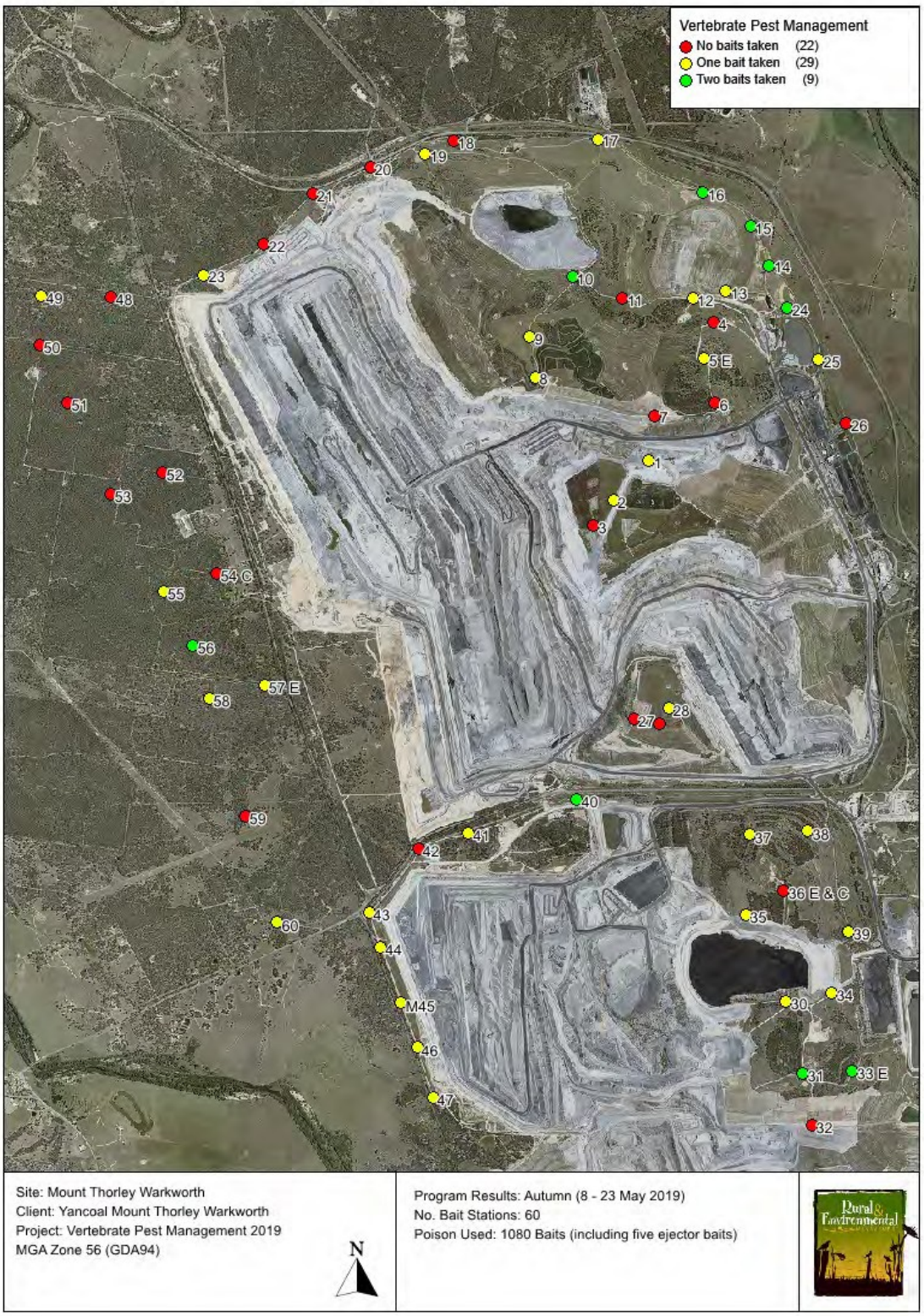


FIGURE 81: BAITING STATION LOCATIONS AND RESULTS AT MTW DURING AUTUMN 2019 VERTEBRATE PEST MANAGEMENT PROGRAMME

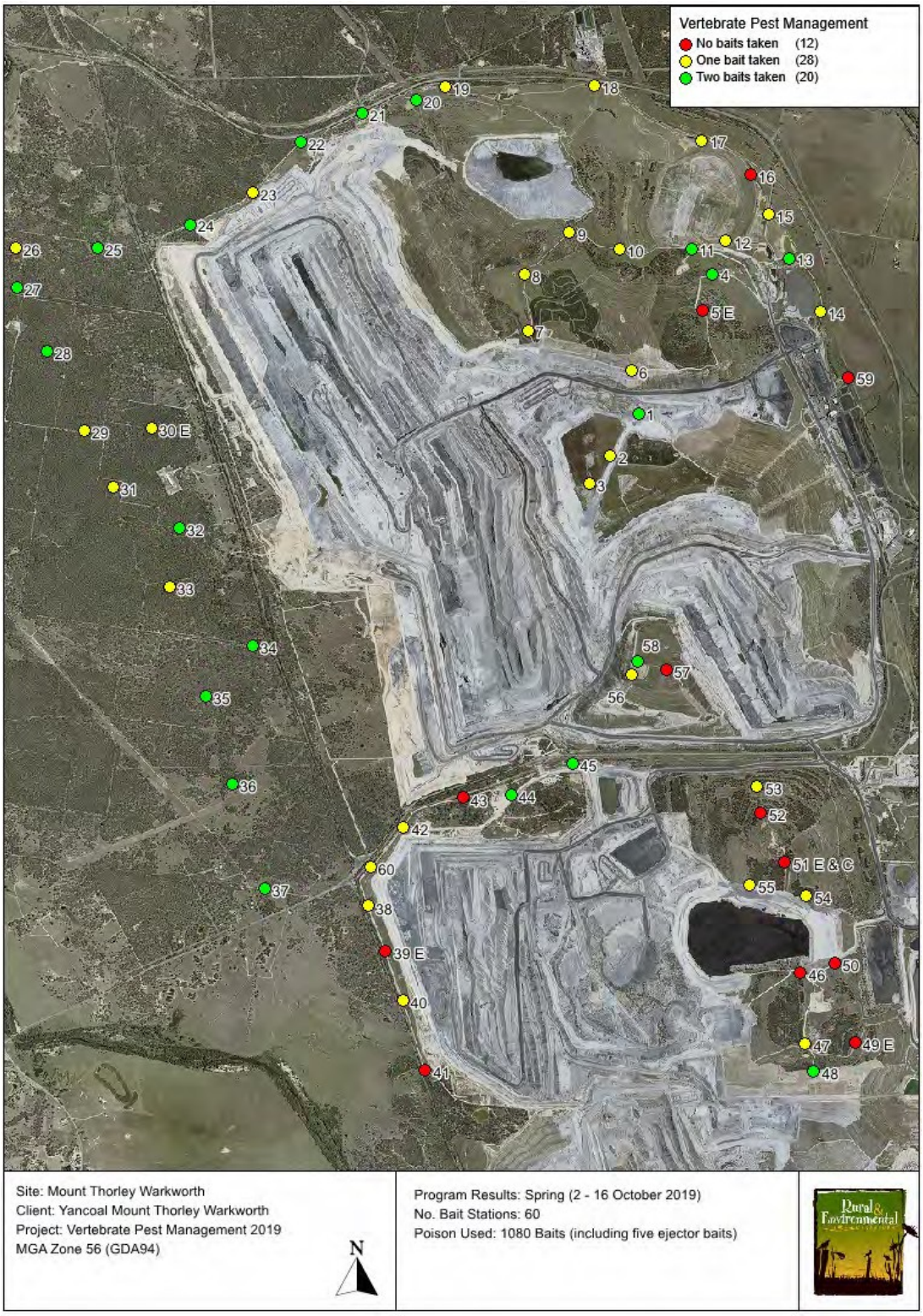


FIGURE 82: BAITING STATION LOCATIONS AND RESULTS AT MTW DURING SPRING 2019 VERTEBRATE PEST MANAGEMENT PROGRAMME

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 listed in **Table 7.7.**

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 Insite website.

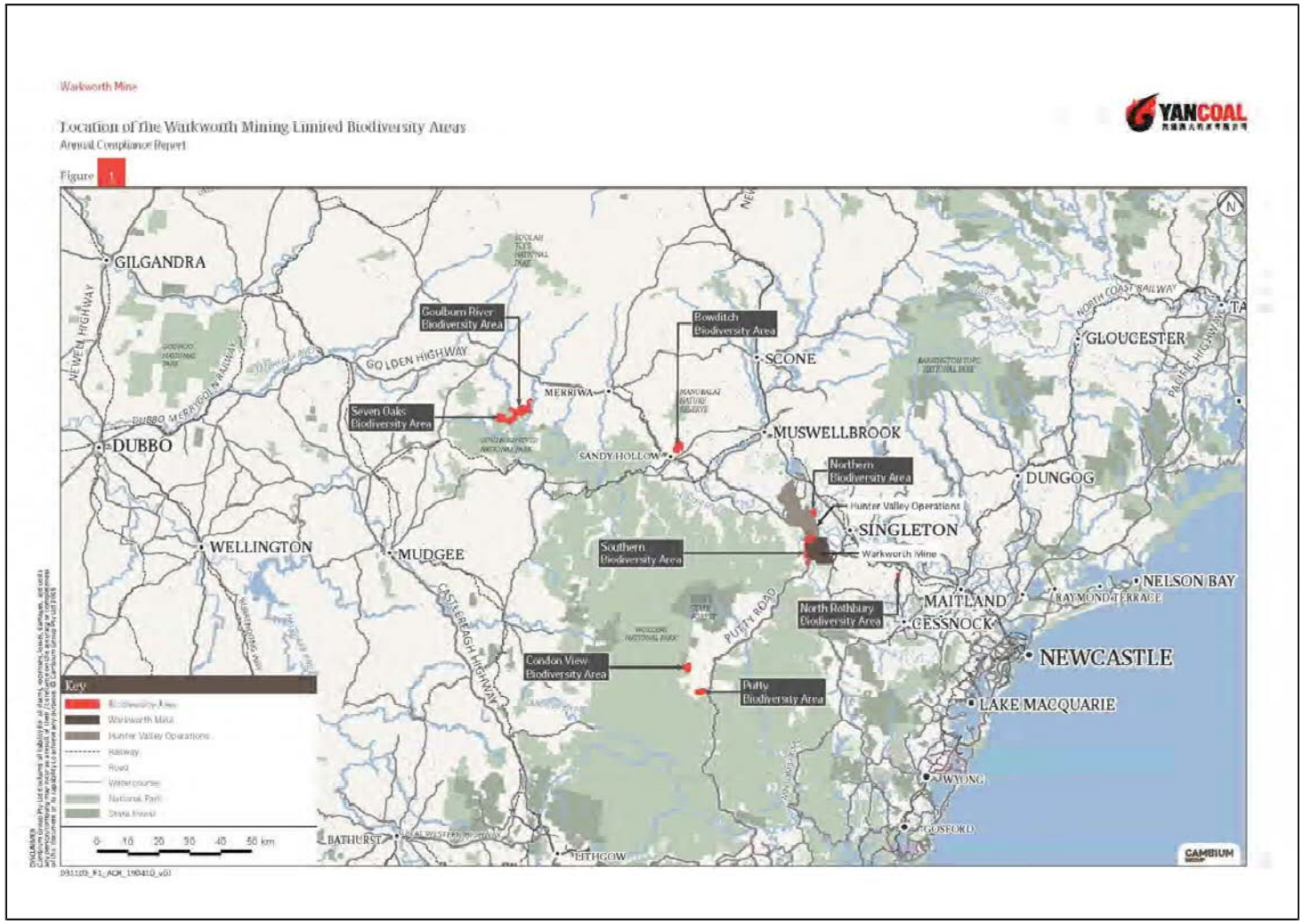


FIGURE 83: MTW BIODIVERSITY OFFSET LOCALITY MAP

7.11.2 Biodiversity Area Management Activities

The OMPs describe the Conservation Management Strategies. The following are the key actions completed throughout 2019 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 curvula)*
- African olive *(Olea europaea subsp. Cuspidate)*
- Blue heliotrope *(Heliotropium amplexicaule)*
- Bridal creeper *(Asparagus asparagoides)*
- Cats claw creeper *(Dolichandra unguis-cati)*
- Castor oil plant *(Ricinus communis)*
- Coolatai grass *(Hyparrhenia hirta)*
- Couch grass *(Cynodon dactylon)*
- Fireweed *(Scenecio madagascariensis)*
- Galenia *(Galenia pubescens)*
- Green cestrum *(Cestrum parqui)*
- Lantana *(Lantana camara)*
- Mother of millions *(Bryophyllum delagonese)*
- Natal grass *(Melinis repens)*
- Paterson's curse *(Echium plantagineum)*
- Prickly pear *(Opuntia stricta)*
- Tree of heaven *(Ailanthus altissima)*
- Tiger pear *(Optunia aurantiaca)*
- Tree pear *(Optunia tomentose)*

Weed control at the Regional BAs targeted the following species:

- Blackberry *(Rubus fruticosus)*
- Bridal creeper *(Asparagus asparagoides)*
- Caltrop *(Tribulus terrestris)*
- Farmers friends *(Bidens pilosa)*
- Fireweed *(Scenecio madagascariensis)*
- Galenia *(Galenia pubescens)*
- Green cestrum *(Cestrum parqui)*
- Lamb's ear *(Stachys byzantine)*
- Lamb's tongue *(Verbascum thapsus)*
- Lavender scallops *(Bryophyllum fedtschenkoi)*
- Narrow leaf cotton bush *(Gomphocarpus fructicosus)*
- Paddy's lucene *(Sida rhombifolia)*

- Prickly pear *(Opuntia stricta)*
- Scotch thistle *(Onopordum acanthium)*
- Stinging nettle *(Urtica dioica)*
- Tiger Pear *(Optunia aurantiaca)*
- Variegated thistle *(Silybum marianum)*
- Willlow *(Salix spp)*

7.11.2.2 Infrastructure Management and Improvement

Fence repairs were undertaken at the Southern and North Rothbury BAs. 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 and the MTW Bushfire Management Plan were reviewed. Slashing of fire breaks was undertaken on the Goulburn River BA. Overall fuel load assessments were undertaken on the Regional BAs to identify current exposure to bushfire fuel hazard and implement a bushfire fuel hazard reduction program. Overall fuel load assessments for the Local BAs have been scheduled for 2020.

7.11.2.4 Strategic Grazing

No strategic grazing was undertaken in the BAs in 2019.

7.11.2.5 Vertebrate Pest Management

Two 1080 ground baiting programmes were undertaken across the Biodiversity Areas targeting wild dogs and foxes. Baits were checked over a three-week period and replaced each week when taken. Baiting was undertaken in autumn and spring and was undertaken in conjunction with neighbouring landholders where possible. **Table 7.8** summarises the results from the programmes carried out on the BA's during 2019.

TABLE 7.8 SUMMARY OF VERTEBRATE PEST MANAGEMENT 2019

Season	1080 Baiting			
	Total Lethal Baits Laid	Takes by Wild Dog	Takes by Fox	Takes by Feral Pigs
Autumn (Local BAs)	120	61	6	29
Spring (Local BAs)	120	77	2	0
Autumn (Regional BAs)	176	53	15	0
Spring (Regional BAs)	181	53	27	0
Total	**597**	**244**	**50**	**29**

Additional pest management programmes included:

- Feral pig 1080 baiting programme carried out across Northern and Southern BA in spring: 29 pigs poisoned.
    - Noisy Miner ground shoot at the Goulburn River BA to assist the survivability of the Regent Honeyeater: 353 Noisy Miners controlled under the Landholder's Licence to Harm Protected Animals (Biodiversity Conservation Act 2016). An additional programme undertaken by ANU/Birdlife Australia involved the implementation of direct nest protection measures including putting collars on nest trees to exclude possums and other predators and a cull of noisy miners and pied currawongs that occur within 200m of an active Regent Honeyeater nest.
- Opportunistic shooting of other vertebrate pests included 22 feral pigs, two foxes, seven rabbits, one feral cat, three deer and one wild dog.
- The Professional Wild Dog Controller Program has trapped and euthanised a total of 19 wild dogs on Yancoal land since July 2017. This is a four-year program 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.

FIGURE 84: NEST PROTECTION MEASURES AT THE GOULBURN RIVER BIODIVERSITY AREA

Vertebrate pest management programmes will continue to be carried out during 2020 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 2019, focussing on the Warkworth Sands Woodland (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 2019 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 2019, restoration work included infill planting 129 ha of Central Hunter Grey Box – Ironbark Woodland and River Oak Forest in the Southern BA and with over 11,000 tube stock planted into rip lines. Infill of 9,100 tube stock was planted into Warkworth Sands Woodland plots in the Southern BA.

Infill planting also continued at the Northern BA with 3,000 tube stock planted into Warkworth Sands Woodland plots.

Planting at the Goulburn River Biodiversity area to increase the suitability of habitat for the Regent Honeyeater commenced with 17,000 tube stock planted in 2019 into the cleared areas of Yellow Box – Grey Box – Red Gum Grassy Woodland and riparian woodland areas. The site preparation for these sites included ripping by dozer, hand auguring and weed control. The team planted the seedlings into rip lines and hand planting areas. All plants were watered, fertilised and protected with a tree guard. The planting period saw well below average rainfall so additional watering was undertaken to assist plant establishment.

The next round of planting is planned for Autumn 2020 and will include 7ha of Warkworth Sands Woodland in the Northern BA with Warkworth Sand imported form areas ahead of mining at MTW. Additional infill of the Central Hunter Grey Box – Ironbark Woodland and River Oak Forest planting areas at the Southern BA will continue.

Supplementary infill planting to re-establish the cleared land in the Yellow Box – Grey Box – Red Gum Grassy Woodland to a Box Gum Grassy Woodland community will continue at the Goulburn River Biodiversity Area.

FIGURE 85: TUBE STOCK PLANTED INTO THE SOUTHERN BIODIVERSITY AREA

FIGURE 86: TUBE STOCK PLANTED INTO RIP LINES AT THE SOUTHERN BIODIVERSITY AREA

FIGURE 87: RIPPING BEING UNDERTAKEN IN THE GOULBURN RIVER BIODIVERSITY AREA

7.12 Audits and Reviews

The NSW Resources Regulator undertook an inspection of rehabilitation areas at MTW on 17 June 2019 which identified that there were ongoing delays in the progression of rehabilitation areas.

As a result of the above observation MTW was directed via two section 240 notices to undertake the following corrective action:

Conduct an independent review of rehabilitation progression which:

- Assesses the adequacy of progressive rehabilitation strategies and performance in implementation of those strategies to date. Provide a plan displaying the status of progressive rehabilitation

Outline any proposed measures or actions to improve progressive rehabilitation performance.

Response to corrective action:

- An independent review of rehabilitation progress was undertaken by Emergent Ecology and a report submitted to Resources Regulator on 30 September 2019. Resources Regulator issued two subsequent section 240 notices stating that the independent review had met the requirements of the original section 240 notices and directed MTW to submit a MOP amendment by 31 March 2020 incorporating the recommendations of the independent review.

The next MTW Independent Environmental Audit is due in **2020.**

8 COMMUNITY

8.1 Complaints

A total of 385 complaints were recorded during the reporting period, with an increase of approximately 10% compared to 2018. The 385 complaints were registered by approximately 50 people (some complainants remained anonymous), with just over 66% 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 41%) in noise complaints from 2017. The decrease experienced from 2017 is partially attributed to increased noise measurements undertaken by the Community Response Officers in 2018 and 2019 and corresponding mitigating actions taken where required.

Dust has emerged as a key concern for the community. 2019 showed an increase of complaints regarding dust by ~90% in comparison to 2018. This increase from 2018 can be partially attributed to below average rainfall in 2019 (304 mm), which is lower than 2018 (457 mm) and 2017 (444 mm). The average annual rainfall recorded at MTW's Charlton Ridge Meteorological station is 630mm, as calculated from 2007 to 2019 annual totals.

In summary:

- 35% reduction in noise complaints;
- Lighting and Water related complaint numbers have remained fairly consistent since 2017, although dust and blasting related complaints were higher than in 2017. An increase in dust complaints from 2017 is considered related to well below average rainfall, consecutively, from 2017 to 2019;
- Complaints in the "Other" category increased from 2017. Complaints in this category were in regards to pest management sightings, blasting information and notifications.

TABLE 8.1 SUMMARY OF COMPLAINTS BY TYPE FOR 2017 TO 2019

Complaint type	2019	2018	2017
Noise	112	171	191
Blasting	94	69	68
Dust	146	76	80
Lighting	27	32	33
Water	0	0	0
Other	6	3	10
Total	**385**	**351**	**382**

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 Insite 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 provide several avenues for community members to register enquiries or complaints, including via community information hotline and Environment and Community personnel;
- 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 InSite 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 were also completed, which included:

- Finalisation the MTW Social Impact Management Plan, and publishing on the MTW website. 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;
- Hosting the Bulga Rural Fire Service (RFS) for a further tour of the RFS access road (Watts Track) to review changes to the area and enable emergency service access to the area following the closure of Wallaby Scrub Road. The access road and entry protocol was approved by the RFS prior to road closure; and the
- 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.

MTW were also involved in various community events through sponsorship and participation.

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 Insite 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.

During the reporting period the CCC members were:

- Dr Col Gellatly - Independent Chair
- Cr Hollee Jenkins - Singleton Council Representative
- Mr Adrian Gallagher – Community Representative
- Mrs Christina Metlikovec – Community Representative (resigned 8 August 2019)
- Mr Graeme O'Brien – Community Representative
- Mr Ian Hedley – Community Representative
- Mr Stewart Mitchell – Community Representative

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 Travis Bates – MTW Community Relations Specialist
- Ms Olivia Lane – MTW Environment & Community Coordinator
- Ms Aleisha Tindall – MTW Community Response Officer
- Mr Patrick Kirkwood – MTW Community Response Officer
- Mr Louis Fleming – MTW Community Response Officer

MTW advertised for new members to join the CCC over a period between 27 November 2019 to 17 January 2020, prompted by the resignation of Mrs Christina Metlikovec in August 2019. 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. The outcome of the application process will be reported in the next Annual Review report.

8.2.3 Community Support and Development

In 2019, 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 2019, 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 2019, MTW contributed a further $800,000 excluding GST, bringing total VPA contributions at end of 2019 to $4.8M 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 2019, the committee was chaired by Mayor Sue Moore and includes senior staff from Council, community representatives, and a Yancoal representative. Pleasingly, there have been two 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), and improvements to Bulga Hall (new media system).

8.2.3.2 MTW Community Support Program

In 2019 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, with the first offer closing 31 January 2019 for the 2019 funding year, and a further offer 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 eh CSP guidelines.

In 2019, MTW supported $150,000 to 19 local projects and initiatives, including:

- University of Newcastle Scholarship Program
- University of Newcastle Upper Hunter Science and Engineering Challenge
- Rotary Club of Singleton on Hunter – 2019 Singleton Art Prize

- Singleton Schools Learning Community – Visible Wellbeing Project (Mental Health Program for teachers and students in all Singleton schools)
- Singleton Business Chamber – 2019 Singleton Business Excellence Awards
- Westpac Rescue Helicopter Service – Hunter Valley Mining Charity Rugby League Competition 2019
- Greta Branxton Rugby League – Sport Equipment
- Newcastle & Hunter Combined Schools ANZAC Service – 2019 Singleton ANZAC Service
- Singleton Theatrical Society – Platinum Sponsorship 2019 Production of 'Les Misérables'
- Mindaribba Warriors Rugby League –Bronze Sponsor
- Singleton District Girl Guides – Shade Shelters
- Singleton Council – Fireworks Display at 'Christmas on John Street 2019'. Sponsorship redirected to local Rural Fire Service organisations after cancellation of fireworks by Council.
- Singleton Rugby Club – Sponsorship towards defibrillator
- Singleton Golf Club Lady Members – Annual Ladies Day Open
- Wildlife Aid Inc - Support for Wildlife care and rescue
- Milbrodale Public School P&C Association - Family Fun Day 2019
- Northern Agriculture Association Inc - Gold Sponsorship - 2019 Singleton Show
- Mates in Mining – sponsorship
- Samaritans Foundation – Christmas Lunch in Singleton 2019

9 INDEPENDENT ENVIRONMENTAL AUDIT

There was no Independent Environmental Audit completed during the reporting period. An update of progress against the Action Plan developed in response to the 2017 Independent Environmental Audit is included in **Appendix 8**. The next MTW Independent Environmental Audit is due in 2020.

10 INCIDENTS AND NON-COMPLIANCE

A summary of the environmental incidents reported during 2019 are provided in **Table 10.1** below

TABLE 10.1 ENVIRONMENTAL INCIDENT SUMMARY 2019

Date	Incident Details	Follow up Actions
30 March 2019	Discharge from two boundary dams at Warkworth (Dam 46N and Dam 53N) as a result of a greater than design rainfall event. A total of 52mm of rainfall was recorded on the day of the incident. 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 infrastructure upgraded on Dam 46N (Additional pump and dewatering pipeline) to improve the sites ability to control stormwater runoff during rainfall. Dam 46N was re-classified to a mine water dam in accordance with the site Water Management Plan. MTW installed a remote boundary dam monitoring system to assist with improving management of the sites remote boundary dams. MTW commissioned an external engineering assessment of its North Pit North water management zone to determine medium to long term actions that could be implemented to reduce the risk of future discharge events during significant rainfall. MTW is currently working through the recommendations from this review.
4 April 2019	A WML North Pit blast, N34-BFA-MD1 fired at approximately 01:09pm on 4 April 2019 recorded an airblast overpressure measurement of 121.2 dB(L) at the Warkworth monitoring location.	An external investigation was undertaken to determine the contribution of relevant factors affecting airblast overpressure to the air pressure level recorded at the Warkworth monitoring station. The investigation concluded that "The reason that the AOP level that resulted at the Warkworth monitoring station was greater

Date	Incident Details	Follow up Actions
		than predicted was due to the fact that the actual meteorological data, and hence the actual effects of meteorology, were different from that predicted." MTW are working with relevant stakeholders to enable the 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. The exceedance was reported to the Department of Planning and Environment and the EPA on 5 April 2019. MTW also notified affected landowners in writing of the exceedance.
7 August 2019	At 13:49 on 7 August 2019 a blast identified as N39-GMB-PR4 was detonated in the North Pit of the Warkworth Mine. The resulting blast dust travelled to the east over land associated with Warkworth Coal Mine, Putty Road, and the Mount Thorley Industrial Estate before dissipating over farmland east of the licenced premises.	MTW has standard operating procedures to mitigate offsite blasting impacts and continues to apply these controls and manage all blast activities in accordance with approved licences and management plans. MTW has reviewed and implemented changes to the sites internal blast operating procedures based on wind speed and direction that could potentially result in a blast plume that does not dissipate prior to reaching the premises boundary in the direction of the Mt Thorley Industrial Estate.
31 December 2019	At the end of the 12 month 2019 calendar year, there were a total of 16 blast events at MTO, of which a single blast vibration result at the Wollemi Peak Road monitor was recorded in the range of 5-10mm/s (actual result 5.67mm/s). Due to the small number of blasts at MTO, this has resulted in 6.3% of blasts at the Wollemi Peak Road monitoring location being in the range of 5-10mm/s, which is greater than the requirements of development consent SSD-6465 which permits up to 5% of blasts to record in the range of 5-10mm/s.	An investigation of the individual result that was >5mm/s (5.67mm/s result recorded on 10 December 2019) was undertaken to determine the potential contributing factors affecting the ground vibration level recorded at the Wollemi Peak Road monitoring station. The investigation identified that ground conditions related to drought conditions and a presplit shot fired shortly after the main production shot, may have both contributed to the higher than predicted result. The blast design checklist has since been revised to reduce the potential for reoccurrence of a similar ground vibration result.

Date	Incident Details	Follow up Actions
		The exceedance was reported to DPIE and to the EPA (via the MTO Annual Return).

WML received two Penalty Notices for the water discharge incident dated 30 March 2019 during August 2019 and an official caution from the EPA in September 2019. One penalty notice was issued by the EPA for a breach of EPL 1376 and a second Penalty Notice was issued by DPIE for a breach of the Warkworth Development Consent. In addition to the follow up actions listed in **Table 10.1**, MTW submitted a revised water management plan for the operation to DPIE during the reporting period to address the incident investigation findings and regulatory feedback associated the water discharge incident.

WML received a Penalty Notice from DPIE in September 2019 in relation to the blast overpressure incident reported to the EPA and DPIE on 5 April 2019. Details of the incident are provided above. The Penalty Notice was in relation to failure to comply with Schedule 3, Condition 8 of Development Consent SSD-6464, for Warkworth mine. The recorded airblast overpressure result exceeded the blast criteria defined in Schedule 3, Condition 8 of 0% allowed to exceed 120 dBL.

11 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Yancoal will endeavour to carry out the following activities during the 2020 reporting period at Mount Thorley Warkworth, as outlined in **Table 11.1**.

TABLE 11.1 PROPOSED ACTIVITIES FOR 2020 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
2	Blasting	• Review and revise the MTW Blast Management Plan for operational changes at MTW.
3	Air Quality	• Integration of additional "North Warkworth" meteorological station into MTW's monitoring network, to assist with decisions around blasting and water management. • Decommissioning of the Wallaby Scrub Road TEOM and integration of the new Wambo Road TEOM into MTW's air quality monitoring network, as approved in MTW's Air Quality Management Plan. The new monitoring location is considered to be more representative of air quality at receptor locations along Wambo Road.

ID	Performance Area	Activities Proposed
4	Aboriginal Cultural Heritage	• Ongoing Aboriginal archaeological and cultural heritage management activities will occur in 2020 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. • MTW will consult with its registered Aboriginal Parties regarding the ongoing management of the new artefact scatter site identified on Charlton Ridge during the 2019 reporting period. • The Hunter Valley Sands Bodies research study will be progressed, as will proactive management within the Wollombi Brook and Loders Creek Aboriginal Cultural Heritage Conservation Areas in accordance with the management plans for those areas. • Conservation Agreements for the Wollombi Brook and Loders Creek Aboriginal Cultural Heritage Conservation Areas will be progressed in 2020. • Relocation of the three cultural scar trees from the active mining area will be undertaken in consultation with the relevant stakeholders.
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 is planning on undertaking an aerial drone review of the three historical heritage sites during the next reporting period to help inform management activities for the period.
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. • 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. • Implement recommendations from NPN water management engineering assessment to reduce risks associated with stormwater management in this zone.

ID	Performance Area	Activities Proposed
7	Rehabilitation	• The rehabilitation monitoring programme will continue in 2020 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 80ha 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 64ha of new rehabilitation will be undertaken at MTW during 2020. • Native woodland seed mixes will be revised based on recommendations from the Independent Rehabilitation Review. • 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 2020 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 2020 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 Centr the Northern and Southern BAs. Supplementary planting to re-establish the c Red Gum Grassy Woodland to a Box Gum Grassy Woodland community an Regent Honeyeater in the River Oak riparian woodland will continue at the Go • Conservation management actions will be undertaken across the BAs in 2020 Plans, these will include weed management in autumn and spring. Vertebrat baiting programmes to target wild dogs and foxes scheduled for autumn and sp in the regent honeyeater breeding area at the Goulburn River BA. Rapid Assessments and property Inspections will be undertaken across all BAs. Restoration Monitoring is scheduled to be undertaken across all BAs. Infrastru and track maintenance will be undertaken as required. • Progress the securing of biodiversity offset areas using the methods detailed i approvals.
9	Community Engagement	• Continued operation of the Community Consultation Committee. • Implementation of the MTW Social Impact Management Plan (which o engagement and consultation requirements).
10	Community Development	• Implementation of the Yancoal Community Support Program (CSP) during 202 seeking applications from the local community for 2021 funding. The CSP prog site or group-wide investment in larger, long-term, capacity building projects include health, social and community, environment, education and training.