Department of Planning and Environment

Our ref: DA92/97-PA-91

Mariah Lane
Environmental Advisor
MACH Energy Australia Pty Ltd
Wonnarua Country

29/09/2023

Sent via the Major Projects Portal only

Subject: Mt Pleasant Coal - 2022 Annual Review

Dear Miss Lane

I refer to the Annual Review for Mount Pleasant Coal Mine for the period 1 January 2022 to 31 December 2022, submitted as required by Schedule 5, Condition 2 of development consent DA92/97 as modified (the consent) to the NSW Department of Planning and Environment (NSW Planning) on 31 March 2023.

NSW Planning has reviewed the Annual Review and considers it to generally satisfy the reporting requirements of the consent and the NSW Planning *Annual Review Guideline* (October 2015). Please make publicly available a copy of the 2022 Annual Review on the company's website within 30 days.

Please note that the NSW Planning's acceptance of this Annual Review is not an endorsement of the compliance status of the project.

Non-compliances identified in the Annual Review will be assessed in accordance with the NSW Planning Compliance Policy. Further correspondence may be sent in relation to non-compliances.

Should you wish to discuss the matter further, please contact Jennifer Sage, Senior Compliance Officer on 0400 245 170 or email compliance@planning.nsw.gov.au

Yours sincerely

Heidi Watters
Team Leader Northern
Compliance

As nominee of the Planning Secretary

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MOUNT PLEASANT OPERATION

2022 ANNUAL REVIEW & ANNUAL REHABILITATION REPORT

Document ID:	20200120		
Company:	MACH Energy Australia Pty Ltd		
Effective Date:		**Status:**	Issued for use
Approved By:	Richard Bailey	**Revision Number:**	00

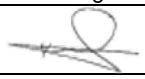
MOUNT PLEASANT OPERATION 2022 ANNUAL REVIEW	
Name of Operation	Mount Pleasant Operation
Name of Operator	MACH Energy Australia Pty Ltd
Development Consent	Development Consent DA 92/97
Name of Holder of Development Consent	MACH Energy Australia Pty Ltd
Mining Leases	Mining Lease 1645, Mining Lease 1708, Mining Lease 1709, Mining Lease 1713, Mining Lease 1750 and Mining Lease 1808
Name of Holder of Mining Leases	MACH Energy Australia Pty Ltd J.C.D Australia Pty Ltd
Water Licences	Water Access Licences – see Table 3 Bore Licence Certificate 20BL168734
Name of Holder of Water Licences	MACH Energy Australia Pty Ltd
Annual Review Start Date	1 January 2022
Annual Review End Date	31 December 2022

I, Richard Bailey, certify that this audit report is a true and accurate record of the compliance status of the Mount Pleasant Operation for the period 1 January to 31 December 2022 and that I am authorised to make this statement on behalf of MACH Energy Australia Pty Ltd.

Note.

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

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

Name of Authorised Reporting Officer	Richard Bailey
Title of Authorised Reporting Officer	General Manager Operations
Signature of Authorised Reporting Officer	
Date	31 March 2023

STATEMENT OF COMPLIANCE

The compliance status of the Mount Pleasant Operation with its relevant approval conditions at the end of the reporting period (31 December 2022) is provided in Table SoC-1.

Table SoC-1
Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Development Consent DA 92/97	No
EPBC 2011/5795	Yes
Environment Protection Licence 20850	No
Authorisation 459	Yes
Mining Lease 1645	Yes
Mining Lease 1708	Yes
Mining Lease 1709	Yes
Mining Lease 1713	Yes
Mining Lease 1750	Yes
Mining Lease 1808	Yes
Water licences (as per Table 3)	Yes
Bore Licence Certificate 20BL168734	Yes

Non-compliances are characterised as shown in Table SoC-2. Table SoC-3 summarises non-compliances with the approval conditions. During the reporting period, there were four observations that resulted in non-compliances against 16 approval conditions (Table SoC-3).

Table SoC-2
Compliance Status Key for Table SoC-3 – Non-Compliances

Risk Level	Colour Code	Comment
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.
Medium	Non-compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur.
Low	Non-compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur.
Administrative Non-compliance	Non-compliant	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).

Table SoC-3
Summary of Non-Compliances

Relevant Approval	Condition Number	Condition Description	Compliance Status	Comment	Report Section
Development Consent DA 92/97	S3 C3	Applicant must comply with all noise criteria.	NC (low risk)	See Table 30	Section 10.2
Development Consent DA 92/97	S3 C18	The Applicant must ensure that no offensive odours are emitted from the site, as defined under the POEO Act, unless otherwise authorised by an EPL.	NC (low risk)	See Table 30	Section 10.2
Development Consent DA 92/97	S3 C26	The Applicant must ensure that any surface water discharges from the site comply with the discharge limits set for the development in any EPL or relevant provisions of the POEO Act or Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002.	NC (low risk)	See Table 30	Section 10.2
EPL 20850	L1.1	Except as may be expressly provided in any condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	NC (low risk)	See Table 30	Section 10.2
EPL 20850	L3.1	Noise generated at the premises must not exceed the noise limits presented in the table below.	NC (low risk)	See Table 30	Section 10.2
EPL 20850	L4.3	Applicant must comply with all blast operating criteria.	NC (low risk)	See Table 30	Section 10.2
EPL 20850	L5.1	No condition of this licence identifies a potentially offensive odour for the purposes of Section 129 of the Protection of the Environment Operations Act 1997.	NC (low risk)	See Table 30	Section 10.2

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1 INTRODUCTION

The Mount Pleasant Operation (MPO) is located in the Upper Hunter Valley of New South Wales (NSW), approximately 3 kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton (Figure 1). The villages of Aberdeen and locality of Kayuga are also located approximately 5 km north north-east and 1 km north of the MPO boundary, respectively (Figure 1). MACH Energy Australia Pty Ltd (MACH Energy) purchased the MPO from Coal & Allied Operations Pty Ltd (Coal & Allied) in 2016.

MACH Mount Pleasant Operations Pty Ltd is the manager of the MPO as agent for, and on behalf of, the unincorporated Mount Pleasant Joint Venture between MACH Energy (95 per cent [%] owner) and J.C.D. Australia Pty Ltd (5% owner).

The initial development application for the MPO was made in 1997. This was supported by an Environmental Impact Statement (EIS) prepared by Environmental Resources Management Mitchell McCotter (ERM Mitchell McCotter) (ERM Mitchell McCotter, 1997). On 22 December 1999, the then Minister for Urban Affairs and Planning granted Development Consent DA 92/97 to Coal & Allied. This allowed for the "Construction and operation of an open cut coal mine, coal preparation plant, transport and rail loading facilities and associated facilities" at the MPO. The consent allowed for operation 24 hours per day, seven days per week and the extraction of 197 million tonnes (Mt) of run-of-mine (ROM) coal over a 21-year period, at a rate of up to 10.5 Mt of ROM coal per year.

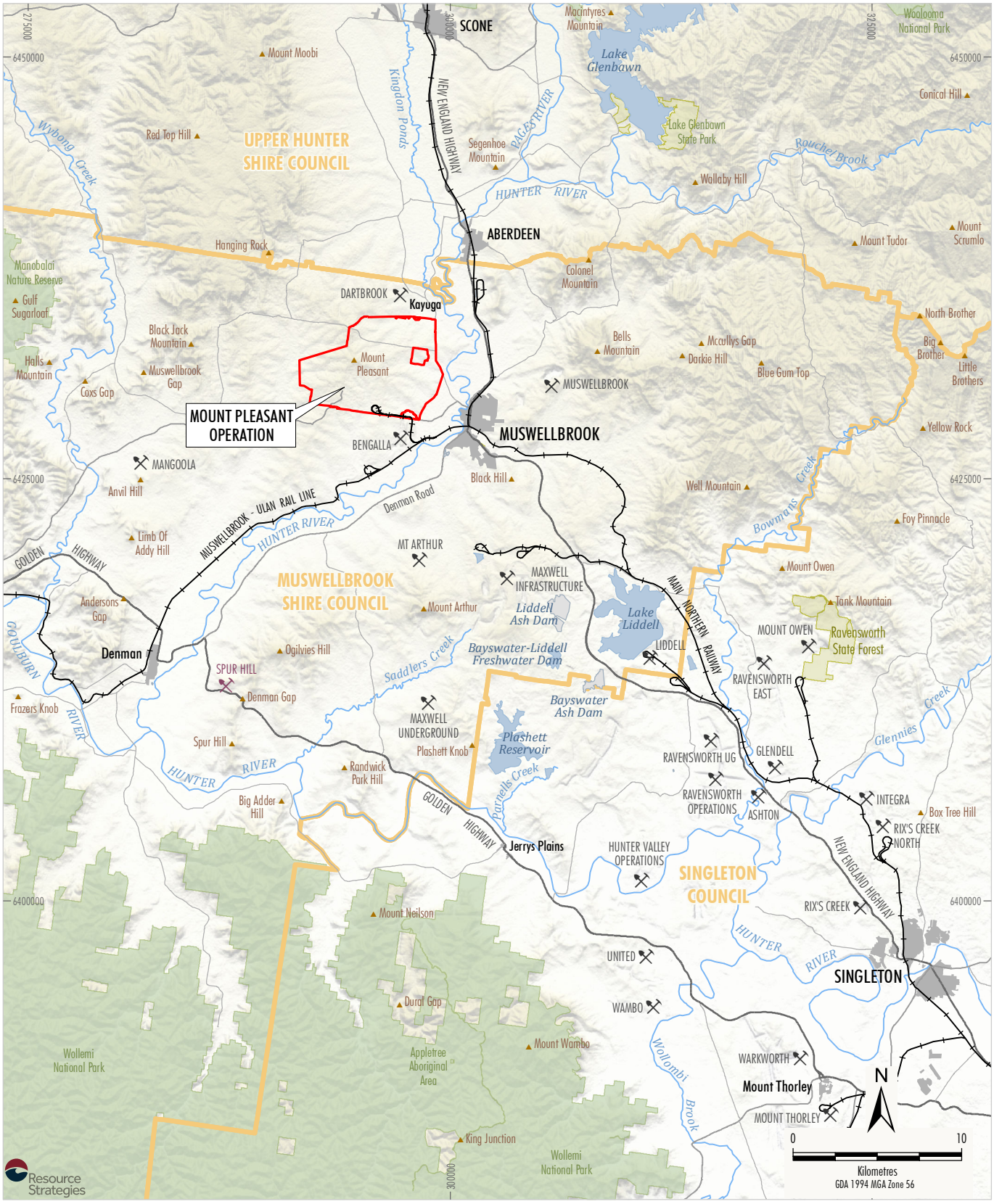
The MPO Modification 1 (MOD 1) was submitted for approval on 19 May 2010. MOD 1 included the provision of an infrastructure envelope for siting the mine infrastructure, the provision of an optional conveyor/service corridor linking the MPO facilities with the Muswellbrook-Ulan Rail Line and modification of the existing Development Consent DA 92/97 boundaries to accommodate the optional conveyor/service corridor and minor administrative changes. MOD 1 was approved on 19 September 2011.

The MPO South Pit Haul Road Modification (MOD 2) was submitted for approval on 30 January 2017 with a supporting Environmental Assessment (EA) prepared by MACH Energy (MACH Energy, 2017a). MOD 2 proposed to realign an indicative internal haul road to enable more efficient access to the South Pit open cut. MOD 2 was approved on 29 March 2017.

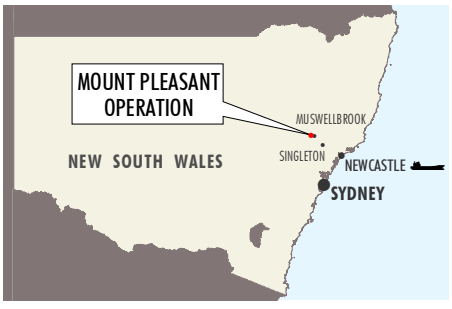
The MPO Mine Optimisation Modification (MOD 3) was submitted on 31 May 2017. MOD 3 comprised an extension to the time limit on mining operations (to 22 December 2026) and extensions to the South Pit Eastern Out of Pit Emplacement to facilitate development of an improved final landform. MOD 3 was approved on 24 August 2018.

The MPO Rail Modification (MOD 4) was submitted on 18 December 2017. MOD 4 proposed the following changes:

- duplication of the approved rail spur, rail loop, conveyor and rail load-out facility and associated services;
- duplication of the Hunter River water supply pump station, water pipeline and associated electricity supply that followed the original rail spur alignment; and
- demolition and removal of the redundant approved infrastructure within the extent of the Bengalla Mine, once the new rail, product loading and water supply infrastructure has been commissioned and is fully operational.



Source: NSW Spatial Services (2023)



LEGEND

- Proposed Mining Operation
- Mining Operation
- Railway
- Local Government Boundary
- State Forest/Reserve
- National Parks and Wildlife Estate
- Mining Lease Boundary (Mount Pleasant Operation)

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MOUNT PLEASANT OPERATION

Project Location

Figure 1

MOD 4 was approved on 16 November 2018. Appendix 2 of the modified Development Consent DA 92/97 illustrates the Conceptual Project Layout Plan of the approved MPO at 2021 and 2025, Approved Surface Disturbance Plan and Conceptual Final Landform incorporating the MOD 4 infrastructure relocations (Development Consent DA 92/97 Attachment 1). MOD 4 construction work continued during the reporting period.

Modification 5 (MOD 5) was submitted to rectify an administrative error in Development Consent DA 92/97 and was approved by the NSW Department of Planning and Environment (DPE) (formerly Department of Planning, Industry and Environment [DPIE]) on 29 June 2022. The MPO continues to be developed and operated under the currently approved MOD 5 of Development Consent DA 92/97.

Following the approval of MOD 5, MACH Energy completed a review of its approved Environmental Management Strategy and management plans in accordance with Condition 4(d), Schedule 5 of the Development Consent DA 92/97. The review determined that no updates were required to the management plans.

On 6 September 2022, the NSW Independent Planning Commission approved the development application for the Mount Pleasant Optimisation Project (SSD-10418), in accordance with Part 4 of the *NSW Environmental Planning and Assessment Act 1979*.

This Annual Review reflects the currently approved MPO under MOD 5 of the Development Consent DA 92/97.

Figure 2 shows the general arrangement of the MPO, as well as the extent of disturbance and rehabilitation at the end of 2022 and the forecast additional disturbance and rehabilitation proposed for 2023.

1.1 PURPOSE AND SCOPE

This Annual Review details MACH Energy's environmental and community performance for the reporting period 1 January 2022 to 31 December 2022. This Annual Review has been prepared in accordance with the DPE *Post-approval requirements for State significant mining developments - Annual Review Guideline – October 2015* (DPE, 2015) and MACH Energy's statutory approvals (Section 2), specifically Condition 3, Schedule 5 of Development Consent DA 92/97 and Condition 3(f) of Mining Leases (MLs) 1645, 1708, 1709, 1713, 1750 and 1808.

This Annual Review is not intended to be an exhaustive description of MACH Energy's operations, approvals and activities, rather it is a summary of MACH Energy's compliance status with respect to MACH Energy's statutory approvals.

In March 2017, the Secretary of the DPE revised the submission timing of the MPO Annual Review to the end of March each year.

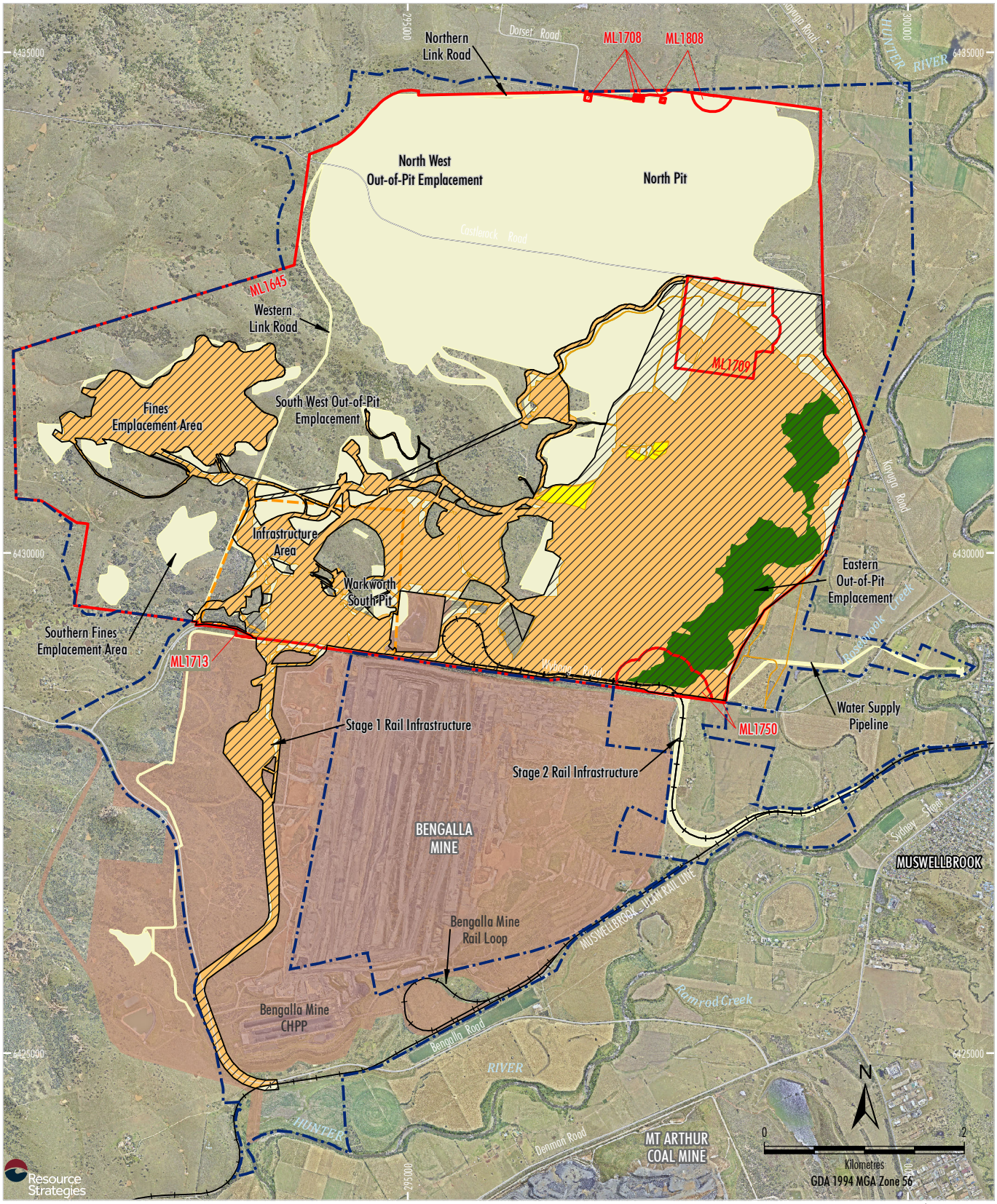
This Annual Review is distributed to a range of stakeholders including government authorities, Muswellbrook Shire Council (MSC) and members of the Community Consultative Committee (CCC). A copy of the Annual Review will be made publicly available on the MACH Energy website (https://machenergyaustralia.com.au/mount-pleasant/documentation/).

1.2 KEY PERSONNEL

Contact details for key MACH Energy personnel responsible for the environmental and community management of the MPO are provided in Table 1.

Table 1
Key Personnel

Position	Contact	Phone Number
General Manager - Operations	Richard Bailey	1800 931 873
General Manager - Resource Development	Chris Lauritzen	
Environmental Superintendent	Andrew Reid	
External Relations Manager	Ngaire Baker	



LEGEND

- Mining Lease Boundary
- Development Consent Boundary
- Approximate Extent of Existing/Approved Surface Development (DA92/97) [1]
- Infrastructure Area Envelope
- RMP 2022 Footprint [2]
- End 2022 Active Disturbance Area
- End 2022 Rehabilitation Area
- 2023 Forecast Additional Disturbance Area
- Bengalla Mine Approved Disturbance Boundary (SSD-5170)

NOTES

[1] Excludes some incidental Project components such as water management infrastructure, infrastructure within the Infrastructure Area Envelope, offsite coal transport infrastructure, road diversions, access tracks, topsoil stockpiles, power supply, temporary offices, signalling, other ancillary works and construction disturbance.

[2] Mount Pleasant Operation Rehabilitation Management Plan (July 2022)

Source: MACH Energy (2023); NSW Spatial Services (2023); Department of Planning and Environment (2016) Orthophoto: MACH Energy (Dec 2022)

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MOUNT PLEASANT OPERATION

2022 Mining Activities

Figure 2

2 APPROVALS

The MPO operates under a number of statutory approvals, leases and licences that regulate activities at the MPO (Tables 2 and 3).

Table 2
Consent, Lease and Licence Details

Consent/Lease/Licence	Authority	Grant/Renewal	Expiry Date
Development Consent DA 92/97[1]	DPE	22/12/1999	22/12/2026
EPBC Approval 2011/5795[2]	DCCEEW^	16/11/2020[2]	28/10/2040
EPL 20850[3]	EPA	24/11/2016[3]	-
Authorisation 459[4]	MEG	07/04/1992	07/04/2025[4]
ML 1645	MEG	17/12/2010	17/12/2031
ML 1708	MEG	02/02/2015	02/02/2036
ML 1709	MEG	02/02/2015	02/02/2036
ML 1713	MEG	02/02/2015	02/02/2036
ML 1750	MEG	03/03/2017	03/03/2038
ML 1808	MEG	29/09/2020	29/09/2041
Bore Licence Certificate 20BL168734	DoI - L&W	13/03/2003	Perpetuity

Note:

EPBC = *Environment Protection and Biodiversity Conservation Act 1999*;

DCCEEW = Department of Climate Change, Energy, the Environment and Water;

EPL = Environment Protection Licence;

EPA = NSW Environment Protection Authority;

MEG = Mining, Exploration and Geosciences within the Department of Regional NSW (formerly Division of Resources and Geoscience); and DoI - L&W = NSW Department of Industry – Lands & Water.

^ Commonwealth Department of Agriculture, Water and the Environment (formerly Commonwealth Department of the Environment and Energy) was superseded by DCCEEW on 1 July 2022.

1 Development Consent DA 92/97 has been modified five times since the original approval was granted in 1999. Approval for MOD 1 was granted on 19 September 2011, approval for MOD 2 was granted on 29 March 2017, approval for MOD 3 was granted on 24 August 2018, approval for MOD 4 was granted on 16 November 2018 and approval for MOD 5 was granted on 29 June 2022.

2 EPBC Approval 2011/5795, originally granted on 29 February 2012, was extended from 28 October 2035 to 28 October 2040 on 16 November 2020. As at 31 December 2022, the EPBC Approval 2011/5795 was in the process of a variation. This Annual Review references the currently approved EPBC Approval 2011/5795 (approved 24 November 2021).

3 As at 31 December 2022, MACH Energy lodged an application for the variation of EPL 20850 and awaiting approval from EPA. This Annual Review references the currently approved EPL 20850 (approved 28 October 2021).

4 A renewal of this Authorisation was granted on 10 February 2023.

MACH Energy will continue to manage its existing Water Access Licences (WALs) (Table 3) and acquire new licences, as required during the next reporting period.

Table 3
MACH Energy Water Access Licences (*Water Management Act 2000*)

Water Sharing Plan	Water Source	Licence Number	Entitlement (Unit)
Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009	Hunter Regulated River Alluvial Water Source	18253	74
		18266	68
		18206	24
		18199	5
		18122	33
		18131	60
		21503	21
	Muswellbrook Water Source	23935	41
	Sydney Basin – North Coast Groundwater Source	41437	640
		40298	90
	Krui River Water Source	18336	12
	Hunter Regulated River Water Source	879	243
		880	124
		1113	366
		973	3
		974	210
		975	8
		988	156
		989	8
		1307	37.5
		1229	480
		1230	8
		1259	33.2
		1227	99
		1258	5
		992	75
		7808	36
		702	267
		1260	4.8
		993	265
		1308	15.1
		604	183
		605	8
		677	24
		1338	17.5
		662	9
		663	16
		10775	243
		41438	455
		638	225
		639	134

2.1 MANAGEMENT PLANS

Development Consent DA 92/97 requires MACH Energy to submit management plans and strategies prior to carrying out any development on-site. The currently approved MPO management plans are summarised in Table 4.

Table 4
Approved Management Plans

Plan	Relevant Development Consent DA 92/97 Condition	Approval Date
Mining Operations Plan (MOP) and Rehabilitation Management Plan (RMP) (1 July 2021 – 30 June 2023)[1]	Schedule 3, Condition 56	24 June 2021
Noise Management Plan (NMP)	Schedule 3, Condition 9	21 December 2021
Air Quality and Greenhouse Gas Management Plan (AQGGMP)	Schedule 3, Condition 23	24 May 2019
Aboriginal Heritage Management Plan (AHMP)	Schedule 3, Condition 36	31 October 2019
Water Management Plan (WMP)	Schedule 3, Condition 28	24 October 2022[2]
Blast Management Plan (BMP)	Schedule 3, Condition 17	14 April 2020
Visual Impact Management Plan (VIMP) (previously the Landscape Management Plan)	Schedule 3, Condition 47	31 October 2019[3]
Waste Management Plan (WasteMP)	Schedule 3, Condition 52	14 January 2019
Rehabilitation Strategy	Schedule 3, Condition 54	24 February 2022
Biodiversity Management Plan (BioMP)	Schedule 3, Condition 32	31 October 2019
Environmental Management Strategy	Schedule 5, Condition 1	20 May 2021
Construction Environmental Management Plan (CEMP)	Schedule 3, Condition 44I	10 March 2020
Out of Hours Work Protocol (OHWP)	Schedule 3, Condition 44G	15 March 2021

Note:

[1] As of 1 August 2022, MPO operates under a Rehabilitation Management Plan (RMP) along with the supporting Annual Rehabilitation Report and Forward Program which has replaced the MOP (1 July 2021 – 30 June 2023). This Annual Review reports against the RMP and Annual Rehabilitation Report and Forward Program.

[2] Following the completion of the Independent Environmental Audit (IEA) undertaken by MACH Energy in accordance with Condition 9, Schedule 5 of Development Consent DA 92/97 on 6 July 2020, the revised WMP was approved on 24 October 2022 to address DPE comments.

[3] The VIMP was subject to review following receival of comments from the DPE on 7 September 2022. The VIMP was then updated and resubmitted on 28 October 2022 to address DPE comments. As at 31 December 2022, the revised VIMP was awaiting approval. This Annual Review reports against the currently approved VIMP (approved 31 October 2019).

A summary of updates approved for the listed management plans during the reporting period is provided below:

- The revised Rehabilitation Strategy was prepared to incorporate updates to maintain consistency with the MOP (at the time) and lodged with DPE on 16 October 2021 and was approved on 24 February 2022.
- The VIMP was updated to include additional details regarding visual impact management measures relevant to MOD 4 rail infrastructure following completion of detailed design and approval of the CEMP. The revised VIMP was lodged on 28 October 2022 and currently awaiting approval.
- The RMP was prepared in accordance with the NSW Resources Regulator Form and Way - *Rehabilitation Management Plan for Large Mines* (July 2021), effective on 1 August 2022. The Rehabilitation Management Plan along with the supporting Annual Report and Forward Program replaces the MOP (1 July 2021 – 30 June 2023).
- The revised WMP was prepared to incorporate updates following the completion of the Independent Environmental Audit and was approved on 24 October 2022.

In accordance with Condition 4, Schedule 5 of Development Consent DA 92/97, MACH Energy will review, and if necessary, revise, the strategies, plans and programs required under the consent within three months of the submission of this Annual Review, to the satisfaction of the Secretary of the DPE.

3 OPERATIONS SUMMARY

3.1 MINING OPERATIONS

MACH Energy commenced construction works at the MPO on 25 November 2016 with mining activities commencing in November 2017. During 2022, MACH Energy completed the following construction activities on site, including:

- completion of the new Rail Loop, Train Load-Out and Hunter River Pump Station relocation approved as part of MOD 4 of Development Consent DA 92/97;
- substantial completion of the Fines Emplacement Area (FEA) Stage 2 Lift Project to increase the capacity for fines deposition; and
- ongoing progressive rehabilitation of temporary construction areas and mining areas.

Mining activities that occurred during the reporting period included:

- continuation of steady-state coal extraction with the development of the open cut footprint progressing to the west;
- significant pumping infrastructure introduced to enable out of pit pumping following significant rainfall events in late 2021 and 2022;
- commencement of mining coal in Terraces 4 and 5 to the west of the open cut following undertaking all pre-strip and blasting activities;
- ongoing modifications to the Coal Handing and Preparation Plant (CHPP) including replacement of the secondary sizer and upgrade materials handling conveyor rate; and
- ongoing progressive rehabilitation of the Eastern Out of Pit Overburden Emplacement Area (including 'natural landform' profiling of areas in accordance with geomorphic design principles [i.e. including macro and micro relief]).

During the reporting period, a total of 9.99 Mt of ROM coal was produced.

The amounts of overburden, ROM coal, coarse reject, fine reject and product coal produced during the previous reporting period, current reporting period and forecast for the next reporting period, are outlined in Table 5.

Table 5
Production Summary

Material	Approved Limit	2021 Reporting Period (Actual)	2022 Reporting Period (Actual)	2023 Reporting Period (Forecast)
Overburden (Mbcm)	N/A	26.59	28.80	32.25
ROM Coal (Mt)	10.5 Mt per calendar year[1]	10.07	9.99	10.5
Coarse Reject (Mt)	N/A	2.47	2.83	2.41
Fine Rejects (Mt)	N/A	0.58	1.03	1.12
Saleable Product (Mt)	N/A	7.27	6.68	7.28

Note:

Mbcm = million bank cubic metres and N/A = not applicable.

[1] Condition 6, Schedule 2 of Development Consent DA 92/97 relevantly states:
The Applicant must not extract more than 10.5 million tonnes of ROM coal from the site in a calendar year.

3.2 OTHER OPERATIONS

Key operational conditions outlined in Schedule 2 of Development Consent DA 92/97 and their corresponding compliance status during the reporting period are outlined in Table 6.

3.3 ACTIVITIES FORECAST FOR THE NEXT REPORTING PERIOD

The following construction activities are forecast to be undertaken during the 2023 reporting period:

- continuation of construction of the onsite pumping and piping infrastructure including installation of the Hunter River Discharge pipeline;
- ongoing installation of visual bunding and vegetation screening as required, to provide screening of the MPO from sensitive viewpoints;
- completion of the FEA Stage 2 Lift Project to increase the capacity for fines deposition;
- installation of larger tailings delivery lines to FEA;
- CHPP feed chute replacement, primary sizer replacement and installation of fines processing annex and associated infrastructure;
- bathhouse facilities expansion at the Infrastructure Area;
- completion of the new High Wall Dam (HWD2) including associated 22 kilovolt (kV) electrical works due to the open cut expansion to the west;
- decommissioning and removal of the current High Wall Dam (HWD1);
- commencement of workshop facility upgrades including new maintenance bays to support the mobile equipment fleet;
- commencement of offsite water discharges in accordance with amendments made to EPL 20850 on 28 February 2023;
- commencement of sitewide civil works and earthworks including maintenance and repair at the mine infrastructure area (MIA), Environmental Dam Mine Infrastructure Area (EDMIA), Mine Water Dam (MWD) Clean Water Diversion Drains and Sediment Dam (SD) 1 – 4 access roads;
- continuation of the civil and drainage upgrades at the CHPP area including works at the CHPP SD; and
- progressive rehabilitation of temporary construction areas and mining areas.

The following mining-related activities are forecast to be undertaken during the 2023 reporting period:

- continuation of steady-state coal extraction within Pits A – F;
- ongoing minor modifications to the CHPP; and
- ongoing progressive rehabilitation of the Eastern Out of Pit Overburden Emplacement Area (including ‘natural landform’ profiling of areas in accordance with geomorphic design principles [i.e. including macro and micro relief]).

Further information regarding proposed construction and mining activities in 2023 is provided in the Forward Program.

Table 6
Key Operational Conditions Met

Operational Condition from Development Consent DA 92/97		Condition Met?	Comment
Limits on Consent (Condition 5, Schedule 2)	5. *The Applicant may carry out mining operations on the site until 22 December 2026.* *Note: Under this consent, the Applicant is required to rehabilitate the site and carry out additional undertakings to the satisfaction of both the Secretary and DRG. Consequently, this consent will continue to apply in all other respects - other than the right to conduct mining operations - until the rehabilitation of the site and these additional undertakings have been carried out satisfactorily.*	Yes	-
Coal Extraction (Condition 6, Schedule 2)	6. *The Applicant must not extract more than 10.5 million tonnes of ROM coal from the site in a calendar year.*	Yes	ROM coal extraction did not exceed 10.5 Mt during 2022.
Coal Transport (Condition 7, Schedule 2)	7. *Product coal may only be transported from the site by rail.*	Yes	Product coal was transported from the site by rail only.
Train Movement (Condition 8, Schedule 2)	8. *The Applicant must ensure that train movements at the site (i.e. arrival or dispatch) do not exceed:* *(a) a maximum of 18 per day; or* *(b) 6 per day, averaged over each calendar year.* *Note: In this condition, "day" means any 24-hour period.*	Yes	The maximum number of train movements at the site was 12 in one day. The average number of train movements was approximately 5-6 per day (Appendix C).
Structural Adequacy (Condition 9, Schedule 2)	9. *All new buildings and structures, and any alterations or additions to existing buildings and structures, that are part of the development, must be constructed in accordance with:* *(a) the relevant requirements of the BCA; and* *(b) any additional requirements of SA NSW where the building or structure is located on land within a declared Mine Subsidence District.* *Notes:* • *Under Part 6 of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works;* • *Part 8 of the EP&A Regulation sets out the requirements for the certification of the development;* • *The development is located in the Muswellbrook Mine Subsidence District. Under Section 21 of the Mine Subsidence Compensation Act 2017, the Applicant is required to obtain the Chief Executive of SA NSW's approval before carrying out certain development in a Mine Subsidence District.*	Yes	All buildings constructed during the reporting period were constructed in accordance with the Building Code of Australia (BCA) and the Subsidence Advisory (SA) NSW.

Table 6 (Continued)
Key Operational Conditions Met

Operational Condition from Development Consent DA 92/97		Condition Met?	Comment
Demolition (Condition 10, Schedule 2)	*10. The Applicant must ensure that all demolition work on site is carried out in accordance with AS 2601-2001: The Demolition of Structures, or its latest version.*	Yes	Demolition work was carried out in accordance with Australian Standard *AS 2601-2001: The Demolition of Structures.*
Protection of Public Infrastructure (Condition 11, Schedule 2)	*11. Unless the Applicant and the applicable authority agree otherwise, the Applicant must:* *(a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the development; and* *(b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the development,* *Note: This condition does not include matters that are expressly provided for in the conditions of this consent, such as the maintenance of public roads.*	Yes	During the reporting period, mine affected properties were vacated, and their electricity was disconnected. This included removal of associated power poles and wires service. MACH Energy incurred the full costs of these removals.
Operation of Plant and Equipment (Condition 12, Schedule 2)	*12. The Applicant must ensure that all plant and equipment used on site, or to transport coal from the site, is:* *(a) maintained in a proper and efficient condition; and* *(b) operated in a proper and efficient manner.*	Yes	All plant and equipment in use at the MPO is maintained in suitable condition.

4 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

A reconciliation of the actions required by the DPE, the previous Annual Review and actions taken in response by MACH Energy during the reporting period are outlined in Table 7.

Table 7
Actions Required by the DPE and 2021 Annual Review

Action	Requested by	Action Taken by Operator	Section Reference
Report on the status of long-term security arrangement for biodiversity offsets required by the development consent for the mine. Please include information on the type(s) of long term security arrangements that have been implemented and/or to be implemented for the mine.	DPE	The status of long-term security arrangements for biodiversity offsets has been included in the section within the Annual Review.	Section 5.5.2
Report on greenhouse gas emissions for the reporting period and include a comparison of actual greenhouse gas emissions against the predictions in the environmental assessment(s) for the mine.	DPE	The comparison of actual greenhouse gas emissions during the reporting period against the estimated greenhouse gas emissions from MOD 3 EA.	Section 5.4.3
Report all reasonable and feasible steps undertaken during the reporting period to improve energy efficiency and reduce greenhouse gas emissions generated by the mine.	DPE	All reasonable and feasible steps undertaken to reduce greenhouse gas emissions have been included in the section within the Annual Review.	Section 5.4.3
Installation of a new bore hole to replace bore 5000D000.	2021 Annual Review	A replacement bore hole was installed in April 2022 to replace bore 5000D000 and has been included in the section within the Annual Review.	Section 6.2.3
Finalisation of the updated WMP with DPE.	2021 Annual Review	The WMP was approved on 24 October 2022 following the completion of the previous IEA on 6 July 2020.	Section 6
Continued consultation regarding the potential Aboriginal Heritage Conservation Areas.	2021 Annual Review	Consultation regarding the potential Aboriginal Heritage Conservation Areas was continued.	Section 5.6 and 9
Continued collaboration with the University of Newcastle on various rehabilitation related research projects.	2021 Annual Review	A summary of the rehabilitation related research projects and sampling results continued in collaboration with the University of Newcastle has been provided in sections within this Annual Review.	Section 5.9 and Section 7.3
Completion of MOD 4 construction activities.	2021 Annual Review	MOD 4 construction activities were completed during the reporting period.	Section 3
IEA to occur in accordance with Condition 9, Schedule 5 of Development Consent DA 92/97.	2021 Annual Review	The next IEA is scheduled to occur on 7 and 8 of March 2023. This will be discussed in the next reporting period.	Section 11

Table 7 (Continued)
Actions Required by the DPE and 2021 Annual Review

Action	Requested by	Action Taken by Operator	Section Reference
Final outcomes of the sustained noise exceedance on 27 August 2021 to be provided in the next Annual Review.	2021 Annual Review	A summary of outcomes has been included in the section within the Annual Review.	Section 10.2
Final outcomes of the water discharge event which occurred on 8 and 9 December 2021 to be provided in the next Annual Review.	2021 Annual Review	A summary of outcomes has been included in the section within the Annual Review.	Section 10.2

5 ENVIRONMENTAL PERFORMANCE

5.1 METEOROLOGY

Meteorological monitoring was undertaken during the reporting period at the mine meteorological stations along Kayuga Road (M-WS4) and Wybong Road (M-WM2) (Figure 3). Data collected included 10 minute, hourly and 24 hourly wind speed, wind direction, sigma, temperature, humidity, solar radiation and rainfall measurements. Data collected during the reporting period has been summarised for rainfall, temperature and wind in the following subsections. M-WS4 has been utilised for this summary as the original meteorological station at the MPO.

5.1.1 Rainfall

During the reporting period, 918 millimetres (mm) of rain was recorded over 79 wet days at the MPO weather station M-WS4. The highest daily rainfall was 60.8 mm on 8 March 2022.

There was an increase in the cumulative rainfall and the number of wet days for the reporting period in comparison to the 2021 reporting period (902 mm and 75 days, respectively). Cumulative rainfall at the MPO has generally been consistent with 2019 levels since the commencement of the MPO, except for 2016, 2020, 2021 and 2022 where significantly more rainfall was received at the site.

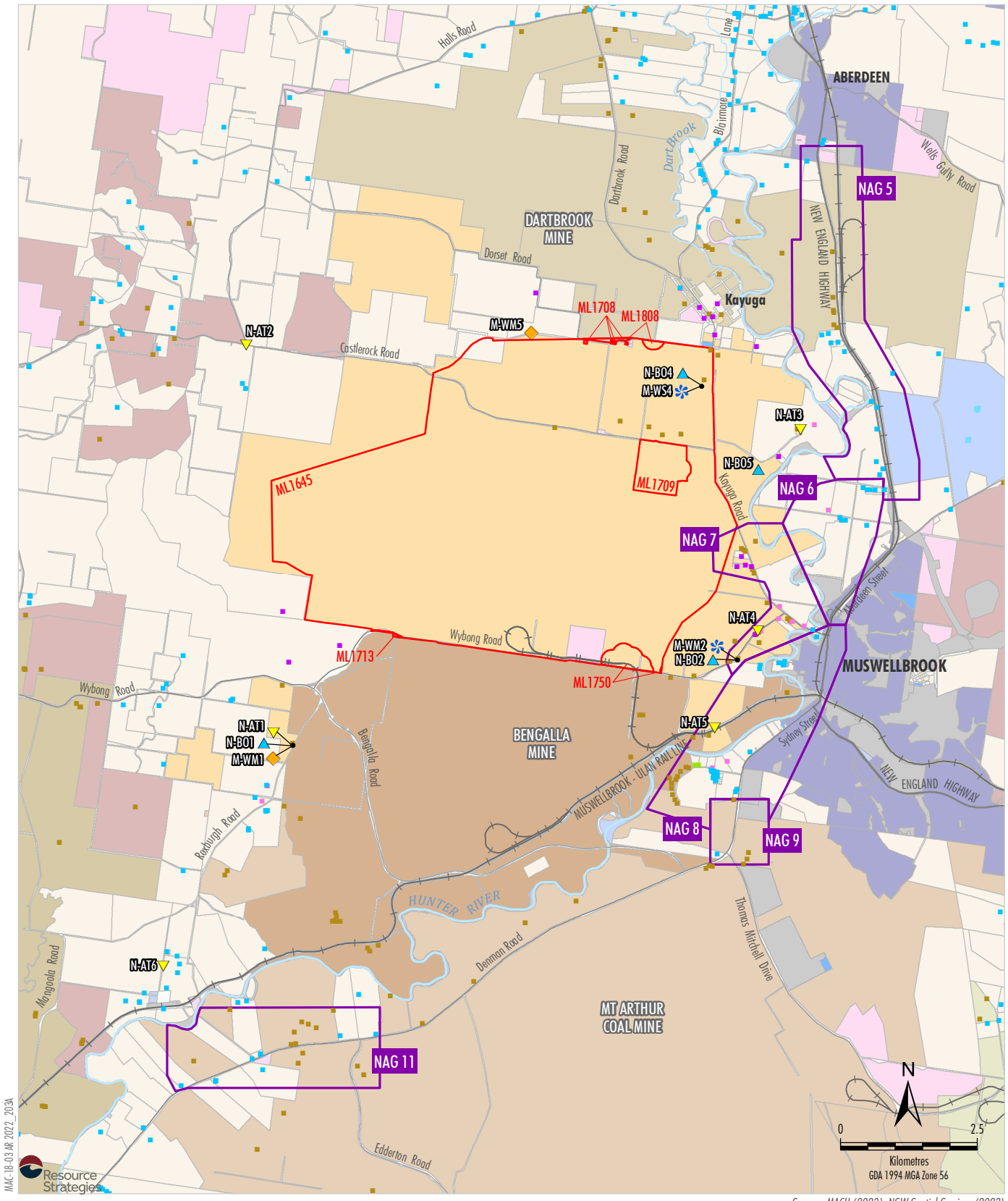
The monthly rainfall distribution, number of wet days and cumulative rainfall is summarised in Table 8. Monthly rainfall records and cumulative rainfall over the reporting period are shown in Chart 1.

5.1.2 Temperature

During the reporting period, the maximum temperature recorded at the MPO weather station M-WS4 was 34.6 degrees Celsius (ºC) (1 February), and the minimum temperature recorded was -1.9 ºC (19 July). Monthly minimum and maximum temperatures derived from hourly temperature measurements are presented in Table 9. Monthly mean temperatures are shown in Chart 2. Monthly temperatures at the MPO during the reporting period are generally consistent with those measured since 2020.

5.1.3 Wind Speed and Direction

During the reporting period, the majority of prevailing winds were from the south-east and north-west. Only a very minor percentage of winds were generated from the south-west and almost none were generated from the north-east. This is consistent with trends observed in previous Annual Reviews (Coal & Allied, 2014, 2015 and 2016; MACH Energy, 2017b; MACH Energy, 2018; MACH Energy, 2019, MACH Energy, 2020, MACH Energy, 2021 and MACH Energy, 2022). An annual wind rose is presented in Chart 3.



Source: MACH (2023); NSW Spatial Services (2023)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1

- Noise Assessment Group (NAG) (DA 92/97)

Category of Rural Residence under DA92/97

- Mine-owned
- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

Monitoring Sites

- Noise Monitoring, Attended Noise
- Noise Monitoring, Real-time Noise Monitoring Site
- Weather Station
- Weather Mast

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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Noise and Meteorological Monitoring Sites

Figure 3

Table 8
Rainfall Summary 2022

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Rainfall (mm)	60.6	35.6	223.4	22.4	38.6	12.4	121.0	86.2	96.2	155.8	52.6	13.0
Cumulative Rainfall (mm)	60.6	96.2	319.6	342.0	380.6	393.0	514.0	600.2	696.4	852.2	904.8	917.8
Wet Days*	5	5	13	5	7	1	7	7	12	11	4	2

Note:

* Wet days are classified as days receiving rainfall greater than 2 mm.

Table 9
Temperature Summary 2022

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum Temperature (°C)	14.7	11.5	11.6	6.6	2.2	-1.2	-1.9	1.4	3.1	4.7	4.2	6.0
Maximum Temperature (°C)	33.4	34.6	30.7	28.5	25.4	19.9	18.4	22.3	22.5	26.9	32.6	34.3

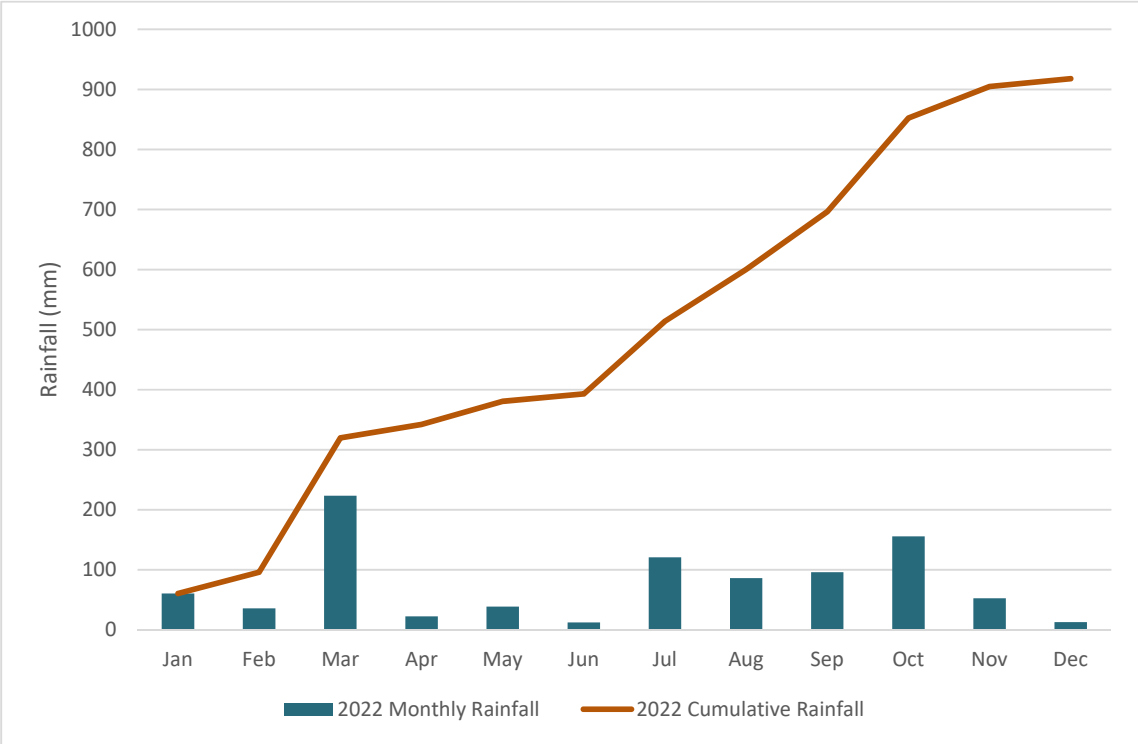


Chart 1: MPO Monthly and Cumulative Rainfall 2022

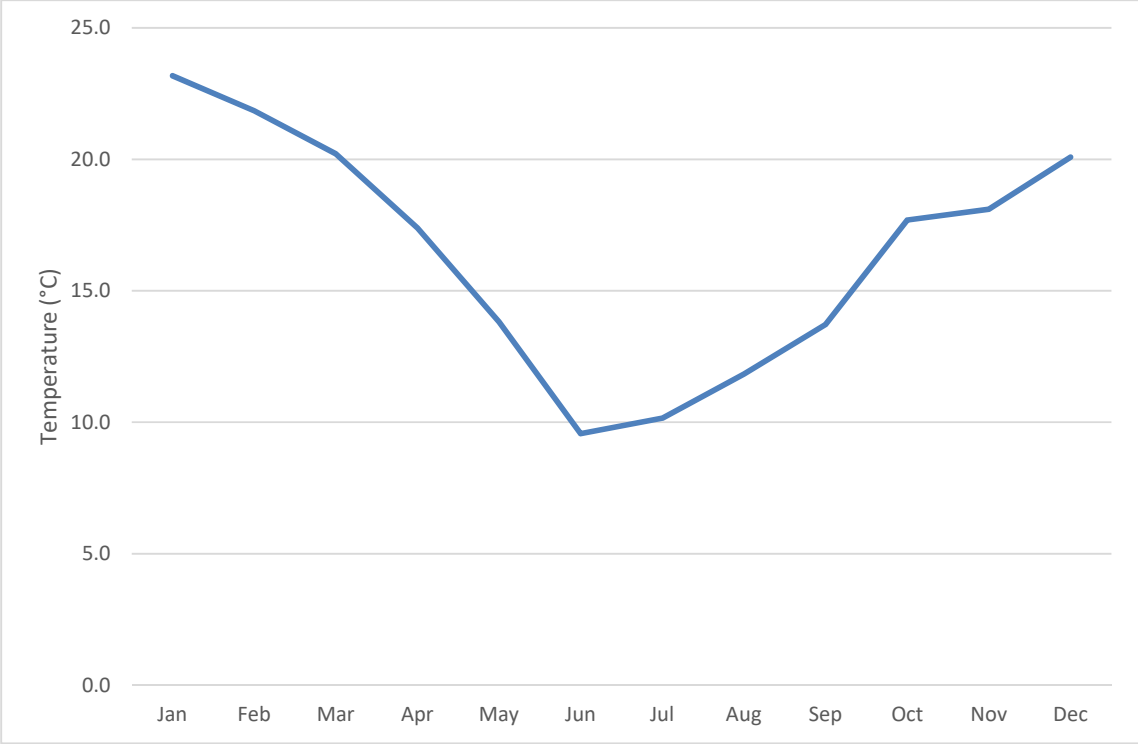


Chart 2: MPO Monthly Mean Temperature 2022

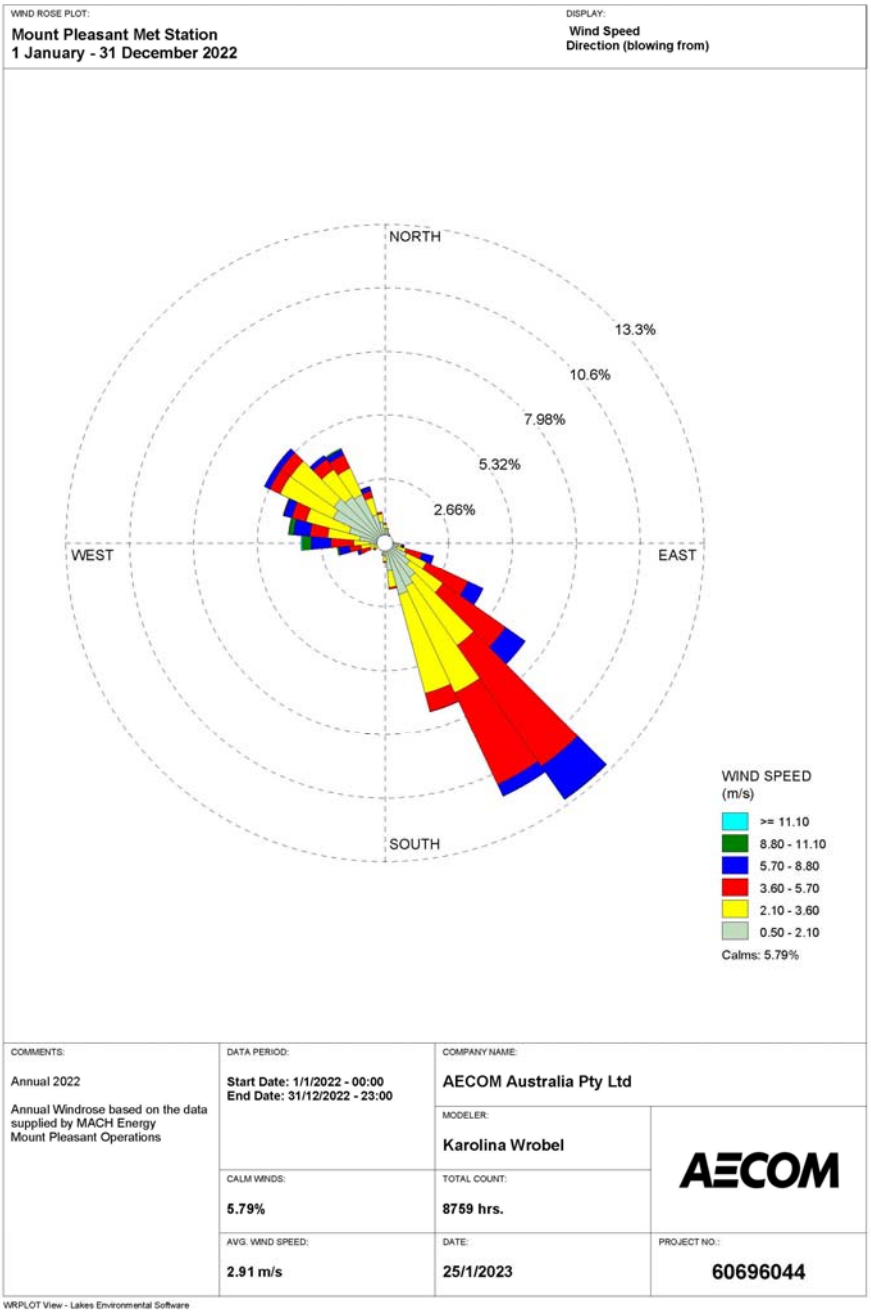


Chart 3: MPO Annual Wind Rose 2022

5.2 NOISE

Key noise criteria for the MPO are defined in Tables 3 and 5 of Development Consent DA 92/97 (Conditions 3 and 5, Schedule 3) and EPL 20850 (Condition P1.3). Additional noise conditions relating to land acquisition, noise mitigation upon request, rail noise, noise monitoring and preparation of the NMP are also detailed in these approval documents.

5.2.1 Approval Criteria and Management Plan Requirements

Development Consent DA 92/97 and EPL 20850

The Noise Impact Assessment Criteria defined in Table 3 of Development Consent DA 92/97 (Condition 3, Schedule 3) is provided in Table 10.

Table 10
Noise Impact Assessment Criteria (dBA)

Location	Day	Evening	Night	
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{A1(1min)}$
68, 74	43	42	42	45
86a	42	42	42	45
35, 35b, 77	42	41	41	45
79, 80a, 140c, 526	41	41	41	45
289	41	40	40	45
84a, 139, 154, 203, 257, 258a	40	40	40	45
83	40	39	39	45
86b, 140a, 202, 259	39	39	39	45
198, 202b	38	38	38	45
260, 261	37	37	37	45
169, 272	36	36	36	45
NAG 5 - All privately-owned land	41	40	39	45
NAG 6 - All privately-owned land	37	37	37	45
NAG 7 - All privately-owned land	40	37	37	45
NAG 8 - All privately-owned land	41	39	39	45
NAG 9 - All privately-owned land	39	38	37	45
NAG 11 - All privately-owned land	37	36	35	45
All other privately-owned land	35	35	35	45

Source: Development Consent DA 92/97 and EPL 20850.

Notes: dBA = A-weighted decibels.

L_{Aeq} = A-weighted equivalent continuous noise level.

$L_{Aeq\ (15\ min)}$ = equivalent continuous noise level over a 15 minute period.

$L_{Aeq\ (1\ min)}$ = equivalent continuous noise level over a 1 minute period.

The cumulative noise criteria defined in Table 5 of Development Consent DA 92/97 (Condition 5, Schedule 3) are provided in Table 11.

Table 11
Cumulative Noise Criteria (dBA)

Location	Day	Evening	Night
	$L_{Aeq(period)}$	$L_{Aeq(period)}$	$L_{Aeq(period)}$
NAG 8, 9	55	45	40
All other privately-owned land	50	45	40

Note: $L_{Aeq(period)}$ = equivalent continuous noise level over a measured period.

The construction noise criteria defined in Table 10A of Development Consent DA 92/97 (Condition 44H, Schedule 3) are provided in Table 12.

Table 12
Construction Noise Criteria (dBA)

Location	Standard Construction Hours
	$L_{Aeq(15min)}$
67, 215, 216, 218,219	47
206, 217, 220, 221, 225, 532, 533	48
222, 223, 531	49
224, 530	50
19, 20, 21, 207, 289	51
527, 528	56
529	54
68	57
23	69
All other privately-owned land	5 dBA above the daytime operational $LA_{eq(15min)}$ noise criteria in Table 10

Source: Development Consent DA 92/97

Noise criteria and other noise related conditions stipulated in EPL 20850 are generally consistent with those prescribed in Development Consent DA 92/97.

Noise Management Plan

A NMP was prepared by MACH Energy in accordance with Condition 9, Schedule 3 of the Development Consent DA 92/97 and approved on 21 December 2021.

The NMP outlines the reasonable and feasible mitigation and management measures adopted at the MPO and describes the following construction and operational noise controls to be implemented to limit construction and operational noise:

- Plant will operate in less exposed areas during the more sensitive evening/night period.
- Vegetation clearance will be limited to daytime hours.
- ‘Quackers’ will be used in place of reverse beepers.
- Noise suppression will be provided on major operational mobile plant.
- Temporary cessation of work within an area, or from a particularly noisy piece of equipment, will be considered when adverse weather conditions are present.
- All plant and machinery used on-site will be maintained regularly to minimise noise generation.

- All plant and machinery used onsite will be operated in a proper and efficient manner (e.g. at correct speed) to minimise noise generation.
- Regular communication and updates will be provided to local residents on the status and nature of site construction and operational activities.
- In the event of a complaint from a local resident, MACH Energy will implement the complaints response process.
- Regular Sound Power Level Testing of the new mobile plant fleet. A summary of the new plant is provided in Section 5.4.3 (Table 17).

The following performance indicators are specified in the NMP to track the performance of the MPO:

- Effective implementation of the Real-time Response Protocol for noise.
- Results of operator attended noise monitoring, conducted and assessed in accordance with the *NSW Industrial Noise Policy* (EPA, 2000) and *Noise Policy for Industry* (NPfI) as relevant, are compliant with the noise criteria in Table 11.
- Complaints are minimised and appropriate management actions are implemented following receipt of a complaint.

Construction Environmental Management Plan

MACH Energy prepared the CEMP during the 2020 reporting period in response to MOD 4 approval (16 November 2018) in accordance with Condition 44I, Schedule 3 of Development Consent DA 92/97. The CEMP was approved on 10 March 2020. The CEMP describes additional control measures to minimise cumulative noise impacts of MOD 4 the Rail 2 Project construction works and the MPO.

Out of Hours Work Protocol

MACH Energy prepared the OHWP during the previous reporting period to undertake MOD 4 construction works (outside of the Mining Lease boundary) outside the hours specified in Schedule 3, Condition 44F of Development Consent DA 92/97. The OHWP was approved on 15 March 2021. The OHWP describes the management of noise associated with the MOD 4 requirement for out of hours construction activities, in accordance with Development Consent DA 92/97.

5.2.2 Performance During the Reporting Period

Operator Attended Noise Monitoring

Operator attended monitoring was undertaken monthly by Global Acoustics Pty Ltd during the 2022 reporting period, in accordance with the NMP, Development Consent DA 92/97 and EPL 20850. Operator attended monitoring was undertaken at six locations selected to represent privately-owned receivers surrounding the MPO, as shown on Figure 3 and in Table 13.

During the reporting period, MACH Energy complied with all relevant development consent conditions relating to noise except for at N-AT4 and N-AT5 during the night period of 17 November 2022. Investigation relating to this exceedance is discussed in Section 5.2.3. A summary of the noise monitoring results recorded during the reporting period are presented in Appendix A.

Monitoring was undertaken in accordance with EPL 20850 and Australian Standard *AS 1055 Acoustics, Description and Measurement of Environmental Noise*.

All applicable measured noise levels attributable to the MPO were generally compliant with the relevant noise criteria from Development Consent DA 92/97 and EPL 20850 during the reporting period, except for the elevated $L_{A1(1min)}$ measurements of 58 and 61 dBA on 17 November 2022 for N-AT4 and $L_{A1(1min)}$ measurement of 49 dBA for N-AT5. Follow-up monitoring and proposed course of action is detailed in Section 5.2.3. There were no exceedances of the construction noise criteria from Development Consent DA 92/97 (Table 12) during the reporting period.

Table 13
Noise Monitoring Locations

Monitoring Location				Justification
Site ID	Description	Easting	Northing	
N-AT1	South-west of the MPO	291465	6427182	Representative of dwellings to the south-west
N-AT2	North-west of the MPO	290608	6434490	Representative of dwellings to the north-west
N-AT3	East of the MPO	300725	6432946	Representative of dwellings to the north-east and east (e.g. NAG 5)
N-AT4	South-east of the MPO	299947	6429264	Representative of dwellings to the east (i.e. NAGs 6 and 7)
N-AT5	South-east of the MPO	299161	6427503	Representative of dwellings to the south-east (i.e. NAGs 8 and 9)
N-AT6	South-west of the MPO	289092	6423155	Representative of dwellings to the south southwest (e.g. NAG 11)

Results of the operator attended noise monitoring for each monitoring round during the reporting period are available in the monthly reporting on the MACH Energy website (https://machenergyaustralia.com.au/mount-pleasant/documentation/).

Real-time Noise Monitoring

Real-time monitoring systems were installed at three locations (N-BO1, N-BO2 and N-BO4) in November 2016 prior to construction work commencing on-site and at one location (N-BO5) in June 2020 (Figure 3). Real-time noise monitoring was undertaken at these locations 24 hours per day, seven days per week for the duration of the reporting period. The real-time noise monitoring was not used to assess compliance with noise criteria, but instead was used for ongoing performance assessment and to inform implementation of real-time response management actions.

During the reporting period, a number of real-time noise monitoring triggers occurred, which prompted the implementation of real-time response management actions where these were related to mining noise from the MPO, consistent with the Real-time Response Protocol outlined in the NMP.

Complaints

A total of 28 noise-related complaints were received by MACH Energy during the reporting period (see Complaints Summary 2022: https://machenergyaustralia.com.au/mount-pleasant/documentation/). The number of noise related complaints received during the reporting period was 58% less than in the previous reporting period. In response to the complaints, the noise monitoring records were reviewed, and the External Relations Manager organised the cessation of noise-intensive works where necessary. In all cases, the External Relations Manager made further contact with the complainant to provide an update of the noise activities. All operator attended noise monitoring results for the reporting period were compliant.

Out of Hours Work Monthly Reporting

No out of hours work was reported during the reporting period.

5.2.3 Trends and Key Management Implications

A noise exceedance event occurred on 17 November 2022, where attended monitoring identified a sustained exceedance (measurements at 00:11 and 00:42) of the $L_{A1(1\ minute)}$ criterion at monitoring location N-AT4. Track noise from MPO at N-AT4 caused exceedances of the $L_{A1,1minute}$ criterion by up to 16 dBA. Elevated $L_{A1(1\ minute)}$ results were also measured at N-AT5 (49 dBA), however additional attended monitoring was commissioned and subsequent readings at N-AT5 returned measurements below the relevant noise criteria. As a result of the noise exceedance event at N-AT4, consultation with the affected landowners and tenants was conducted and the proposed course of actions by MACH Energy is outlined below:

- extended attended noise monitoring for up to three months to include measurements closer to the area of residence most likely to be impacted;
- notification (in writing) the affected landowner(s) and tenants of the potential exceedance and extended monitoring period; and
- communication of results of the extended noise monitoring period (in writing) to the DPE and affected landowners and tenants following completion of the additional monitoring.

MACH Energy followed the NMP procedure and no environmental harm nor known impacts on the amenity of nearby residences occurred. In addition to this, no complaints were received in the night-time period of the elevated reading and no complaints were received from residents within the potentially impacted noise assessment group (NAG 7) in which N-AT4 is located.

MACH Energy considers that the duration of the non-compliance was short and not indicative of a sustained non-compliance with the relevant criteria. Additional attended noise monitoring throughout winter 2022 has indicated continued compliance, in addition to the regular compliance monitoring conducted and reported, and this outcome is supported by a reduction in complaints received year-to-date.

The monitoring results are generally consistent with the results recorded during the 2021 reporting period (MACH Energy, 2022). In particular, noise levels were observed to have decreased at N-AT3 and N-AT4 as mining progressed north (i.e. away from the monitors) and as MOD 4 construction works progressed away from the monitors during the reporting period.

Noise-related complaints decreased in 2022 compared to 2021, likely due to the completion of MOD 4 construction works. No MOD 4 construction works specific complaints were received during the reporting period. MACH Energy continued the development of the Eastern Out of Pit Overburden Emplacement Area during the reporting period, which provides shielding of operations to Muswellbrook and nearby residences.

Comparison to MOD 3 Predictions

MOD 3 predictions for noise were modelled for three scenarios during the mine life (i.e. Year 2018, Year 2021 and Year 2025). The attended monitoring noise levels were generally below the predicted $L_{Aeq(15min)}$ levels under applicable meteorological conditions. There were several measured $L_{Aeq(15min)}$ noise level levels at N-AT4 and N-AT5 that were slightly above the MOD 3 predicted levels in November 2022.

The elevated level recorded was not linked to any specific operational practices, and no trend of elevated levels was observed. Such minor differences between levels and predicted levels are likely due to the inherent uncertainties associated with predictive modelling (e.g. activities may not occur in the same location, or at the same magnitude, as anticipated when developing predictive models).

5.2.4 Implemented or Proposed Management Actions

All noise management measures outlined in the NMP and summarised in Section 5.2.1 were undertaken during the reporting period. In particular, MACH Energy continued to implement real-time noise monitoring at the four real-time noise monitoring locations with the Real-time Response Protocol used where appropriate.

MACH Energy commissioned a review of the MPO's noise management regime by a recognised noise specialist during the previous reporting period. The review's findings indicated the MPO's existing noise management practices are commensurate with best practice. Notwithstanding, some minor revisions to the noise monitoring network were recommended. Consistent with the recommendations of the review, the NMP was updated to relocate monitor N-AT3 approximately 600 metres (m) to the north-east and to adjust the real-time response triggers for N-BO2. The updated NMP was approved on 21 December 2021.

5.3 BLASTING

Airblast overpressure and ground vibration assessment criteria for the MPO are defined in Table 2 of Development Consent DA 92/97 (Condition 10, Schedule 3) and EPL 20850 (Conditions L4.2, L4.3, L4.4 and L4.5). Additional conditions relating to blasting hours and frequency, property inspections and investigations, monitoring locations, measurement methodology, operating conditions and preparation of the BMP, are also detailed in these approval documents.

MACH Energy prepared a revised BMP which was approved by DPE on 14 April 2020. The BMP was revised to reflect the relocation of blast monitoring site B-VO2 to accurately reflect the near sensitive receivers. Site B-VO2 was relocated approximately 1350 m to the east.

5.3.1 Approval Criteria and Management Plan Requirements

Development Consent DA 92/97 and EPL 20850

A summary of the assessment criteria for blasting is included in Table 14.

Table 14
Assessment Criteria for Blasting

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s)	Allowable Exceedance
Residence on privately-owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites	-	10	0%
All public infrastructure	-	50	0%

Source: Table 7 of Development Consent DA 92/97 (Condition 10, Schedule 3).
Notes: mm/s = millimetres per second and dB = decibels.

Conditions L4.2, L4.3, L4.4 and L4.5 of EPL 20850 contain the same blasting assessment criteria for residences on privately-owned land as specified in Table 15. However, EPL 20850 requires that monitoring does not exceed these criteria at monitoring sites B-VOC and B-VO2 rather than at all residences on privately-owned land (Figure 4).

Airblast overpressure, ground vibration and fume monitoring were conducted for every blast event at the blast monitoring sites shown on Figure 4.

5.3.2 Performance During the Reporting Period

A total of 93 blasts occurred during the reporting period and are detailed in Appendix B. An elevated blast overpressure reading was recorded on 2 September 2022 at monitoring site B-VOA after a blast event. The elevated reading was self-reported by MACH Energy to the DPE and EPA via email on the day of the blast. Although an elevated reading did occur at monitoring site B-VOA, the elevated overpressure result was not an exceedance of its operating condition in either the Development Consent DA 92/97, EPL 20850 or the BMP, as there are no privately owned residences in the area of B-VOA. Following this event, monitoring site B-VOA will be removed from EPL 20850 under a variation, as this monitor is for internal premises monitoring and does not provide relevant information regarding potential offsite impacts, subject to variation approval. This will be confirmed in the next reporting period.

There were no community complaints as a result of the incident on 2 September 2022. No blast fume events occurred during the reporting period.

Comparison to MOD 3 Predictions

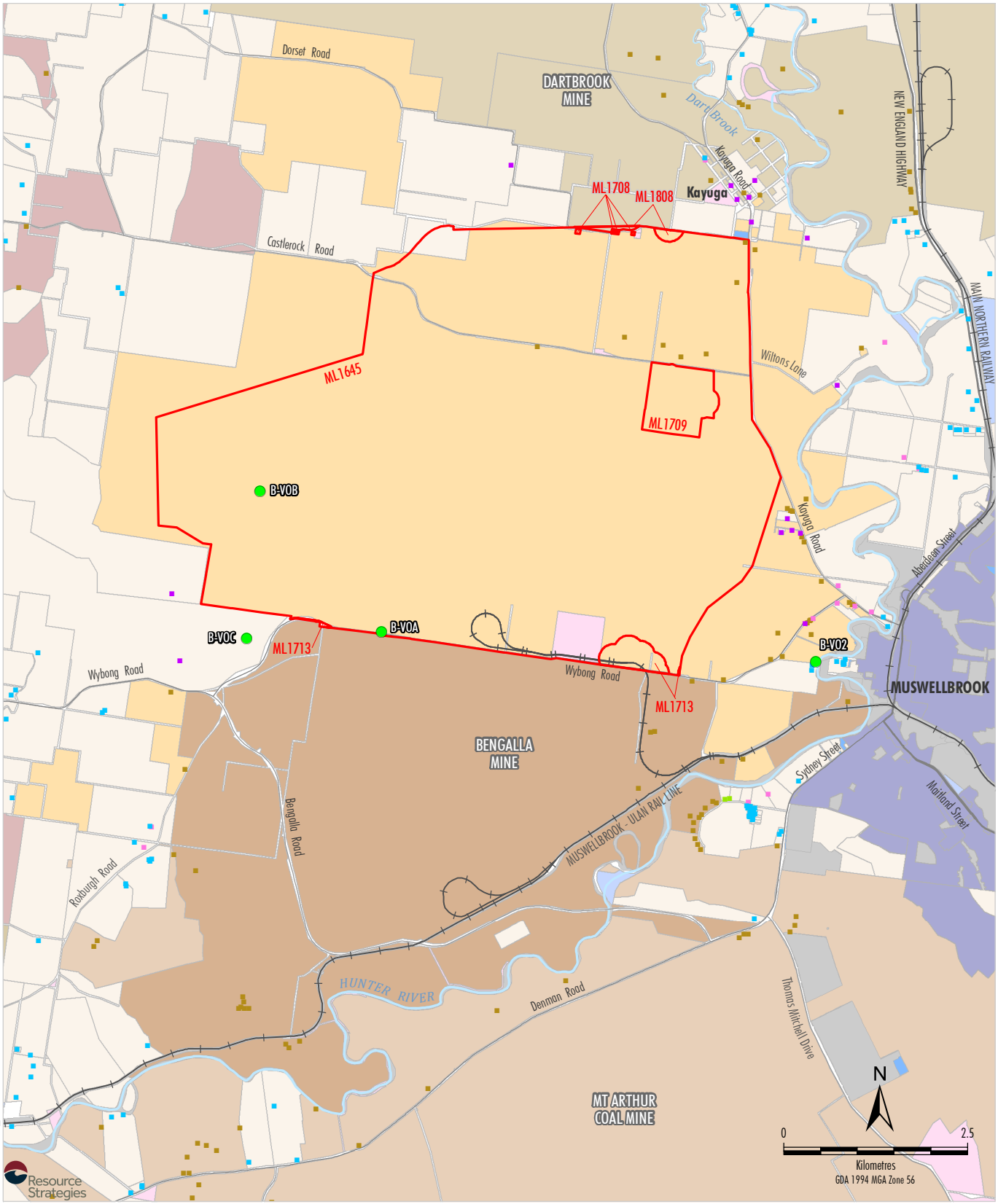
A comparison of MPO's blast performance against the MOD 3 predictions is summarised in Table 15. Monitors B-VOC and B-VO2 are located in close proximity to Receiver 43 and Receiver 67 and comparative discussion is provided below. For other receivers, direct comparison with monitoring results is obscured by the distance between blast locations, receivers and blast monitors.

Table 15
Comparison of MOD 3 Predictions and 2022 Raw Monitoring Data

Closest Receiver ID	MOD 3 Predictions		Closest Blast Monitoring Site to Land Holder	Maximum Recorded Level in 2022	
	Airblast Overpressure (dBL [in Peak])	Ground Vibration (mm/s)		Airblast Overpressure (dBL [in Peak])	Ground Vibration (mm/s)
43	111.2 to 112.1	0.6 to 1.1	B-VOC	116.0	1.56
272	111.1 to 111.2	0.5 to 0.6	B-VOC	116.0	1.56
153	111.4 to 112.5	0.8 to 1.4	B-VOA	122.7	2.71
147	111.7 to 114.2	0.9 to 2.5	B-VO2	111.6	1.62
136	112.2 to 117.3	1.2 to 5.3	B-VO2	111.6	1.62
121	113.7 to 119.9	2.1 to 8.6	B-VO2	111.6	1.62
112	114 to 120.1	2.3 to 8.8	B-VO2	111.6	1.62
67	113 to 115.6	1.7 to 3.6	B-VO2	111.6	1.62
23	111.9 to 114.3	1.1 to 2.6	B-VO2	111.6	1.62

Source: Table 8-1 of MPO MOD 3 Noise & Blasting Assessment.

Blast predictions are made using a site-specific empirical prediction model to best predict airblast and ground vibration levels. At Receiver 43, Receiver 153 and Receiver 272, maximum recorded results are higher than the range of predictions made in MOD 3. As mentioned above, this may be due to the distances between blast locations, receivers and blast monitors and also a difference in site conditions, compared to the empirical data used to establish the predictions. At all other receivers, Table 15 shows that blast monitoring data at the most representative monitoring site are also generally within or marginally sometimes lower than the ranges predicted. Blast monitoring data will continue to be collected and a site-specific empirical prediction model will continue to be refined to assist blast planning and performance review.



Source: MACH (2023); NSW Spatial Services (2023)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1

Category of Rural Residence under DA92/97

- Mine-owned
- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

Monitoring Sites

- Blasting (Vibration/Overpressure)

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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Blast Monitoring Sites

Figure 4

Complaints

A total of 2 blasting-related complaints were received by MACH Energy during 2022 (see Complaints Summary 2022: https://machenergyaustralia.com.au/mount-pleasant/documentation/). The number of blasting related complaints received during the reporting period was half than that received in the previous reporting period. In response to the complaints, blasting activities were reviewed for compliance. All blasting results for the reporting period were compliant with relevant blast overpressure and vibration criteria (Section 5.3.1). Following the compliance review, the External Relations Manager made further contact with the complainants to provide an update of the blasting activities.

5.3.3 Trends and Key Management Implications

There were 93 blasts recorded during 2022, compared with 106 in 2021. Blasting-related complaints decreased in 2022 compared to 2021 due to the continued progression of mining activities away from Muswellbrook and nearby residences.

Airblast overpressure and ground vibration levels recorded during 2022 generally decreased compared with 2021 as blasting occurred further from Muswellbrook and nearby receivers as mining activities progressed west during the reporting period. All overpressure and vibration measurements during the reporting period complied with the relevant criteria within Development Consent DA 92/97 and EPL 20850.

5.3.4 Implemented or Proposed Management Actions

Notifications of upcoming blasts were provided on MACH Energy's and MSC's websites. In addition, MACH Energy notified private landholders or residents who expressed an interest in being informed of the MPO blasting schedule and were, therefore, on the MPO pre-blast notification register.

Any blasts within 500 m of Wybong, Kayuga, Castlerock and Dorset Roads triggered a road closure and implementation of relevant mitigation measures. In 2022, 16 road closures occurred on Wybong Road due to blasting activities within Pit A and C. No other roads were closed due to blasting activities.

All appropriate steps to reduce dust generation from blasting and ensure best practice blasting techniques were undertaken in accordance with the MPO BMP. MACH Energy will continue to implement these measures.

5.4 AIR QUALITY

Air quality criteria for the MPO are presented in Tables 8, 9 and 10 of Development Consent DA 92/97 (Condition 20, Schedule 3) and EPL 20850 (Condition O3.4). Additional conditions relating to operating conditions, greenhouse gas emissions, odour, acquisition criteria and preparation of the AQGGMP are also provided in Development Consent DA 92/97 and EPL 20850.

5.4.1 Approval Criteria and Management Plan Requirements

Development Consent DA 92/97

In accordance with Condition 20, Schedule 3 of Development Consent DA 92/97, MACH Energy must ensure that all reasonable and feasible avoidance mitigation measures are employed so that particulate matter emissions generated by the MPO do not exceed the criteria summarised in Table 16 at any residence on privately-owned land (excluding land subject to acquisition upon request for potential air quality impacts).

Table 16
Approval Criteria for Particulate Matter

	Pollutant	Averaging Period	[d]Criterion
Long-term Impact Assessment Criteria	TSP	Annual	[a]90 µg/m^3
	PM_{10}	Annual	[a]25 µg/m^3
	$PM_{2.5}$	Annual	[a]8 µg/m^3
	Deposited Dust[c,d]	Annual	[b]2 g/m^2/month
			[a]4 g/m^2/month
Short-term Impact Assessment Criteria	PM_{10}	24 hour	[b]50 µg/m^3
	$PM_{2.5}$	24 hour	[b]25 µg/m^3

Source: Development Consent DA 92/97 (Condition 20, Schedule 3).

Note: TSP = Total Suspended Particulates;
PM_{10} = particulate matter less than or equal to 10 micrometres in diameter;
$PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometres in diameter;
µg/m^3 = micrograms per cubic metre; and
g/m^2/month = grams per square metre per month.

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

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

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

[d] *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.*

Environment Protection Licence 20850

Air quality criteria and other air quality related conditions stipulated in EPL 20850 are generally consistent with those prescribed in Development Consent DA 92/97, with the exception of Conditions O3.4 to O3.9, which state:

> ***O3 Dust***
>
> *…*
>
> *O3.4 The Licensee must cease all dust generating activities during adverse conditions being the occurrence of both:*
>
> *i) the adverse wind conditions set out in Condition O3.5 (b), and*
>
> *ii) the adverse PM10 concentrations set out in Condition O3.5 (c).*
>
> *O3.5 For the purpose of Condition O3.4 the following definitions apply:*
>
> *(a) 'dust generating activities' means drilling, blasting, earthworks, construction activities, all hauling activities on unsealed haul roads, all overburden and coal extraction operations including loading and dumping activities and grader, loader, dozer and dragline operations.*

(b) 'adverse wind conditions' means the 1-hour average wind direction between 250 degrees and 340 degrees (inclusive) measured at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network monitor. Australian Standard AS3580.14-2014 is to be used to calculate the 1 hour average wind direction.

(c) 'adverse PM10 concentrations' means a rolling 24-hour average PM10 concentration of equal to or greater than 44 micrograms per cubic metre measured at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network monitoring station.

(d) Operation of watercarts is permitted at all times.

(e) Activities within the Coal Handling and Preparation Plant and Materials Handling Area, including run-of-mine (ROM) coal, product coal handling (including dozer/loader operations) and train loading operations as identified in blue on plan titled 'Mt Pleasant Coal Mine Materials Handling Area Dust Exclusion Zone General Arrangement' drawing number MP001-0000-GEN-DRG-0026 (EPA ref Doc19/282883) are not included as dust generating activities provided all automated dust suppression spray systems at the ROM hopper, conveyor transfer points and product stockpiles are in use, at least one water cart is in use on the ROM stockpile and an adjustable hood is lowered onto rail wagons loadings.

O3.6 Shutdown of dust generating activities required by Condition O3.4 must be completed within 1 hour of receiving data that triggers action required by Condition O3.4.

O3.7 The licensee may resume dust generating activities at the premises when:

(a) adverse wind conditions as defined in Condition O3.5(b); or

(b) adverse PM10 concentrations as defined in Condition O3.5(c) are not measured for a minimum time period of 1 hour from the time that cessation of dust generation activities is completed.

O3.8 At any time when there is no access to the meteorological data or PM10 data from the Muswellbrook NW Upper Hunter Air Quality Monitoring Network monitoring station, definitions of 'adverse wind conditions' and 'adverse PM10 concentrations' in condition O3.5 are replaced with:

- *'adverse wind conditions' means a 1-hour average wind direction between 245 and 345 degrees (inclusive) measured at EPA Monitoring Point 11, identified in condition P1.3*
- *'adverse PM10 concentrations' means a rolling 24-hour average PM10 concentration of equal to or greater than 44 micrograms per cubic metre measured at the EPA Monitoring Point 1, identified in condition P1.3*

Note: If at any time, there is no access to the Muswellbrook NW Upper Hunter Air Quality Monitoring Network monitoring station and to either 1-hour average wind direction data from monitoring point 11 or PM 10 data from monitoring point 1 the licensee must cease dust generating activities at the premises.

O3.9 For the purpose of condition O3.5 (e), dust suppression systems must be operated in a manner to ensure that there is no visible dust emissions emitted from the premises.

Air Quality and Greenhouse Gas Management Plan

MACH Energy prepared an AQGGMP which was approved on 24 May 2019. The AQGGMP was revised to reflect the approval of MOD 3 and 4 and update the real-time response triggers to align with the amended dust conditions within EPL 20850 as described above.

The AQGGMP outlines the reasonable and feasible mitigation and management measures adopted at the MPO in accordance with Condition 20, Schedule 3 of Development Consent DA 92/97. The reasonable and feasible mitigation measures include:

- specific management measures for adverse weather conditions (e.g. ceasing all dust generating activities during specific weather conditions as required by Conditions O3.4 to O3.9 of EPL 20850);
- general dust management measures (e.g. use of water carts to minimise wheel generated dust);
- the use of predictive modelling to assist in day-to-day planning;

- real-time response protocols with tiered management actions based on several alert levels;
- odour and fume management measures;
- greenhouse gas emission reduction strategies; and
- cumulative air quality management, including a protocol for communication with representatives of other mining operations.

5.4.2 Performance During the Reporting Period

Dust Deposition

During the reporting period, dust deposition levels were collected at 13 dust deposition gauges situated around the MPO boundary (Figure 5). The gauges were sited in accordance with *AS 3580.1.1:2007* and analysed for mass of total insoluble matter and ash in accordance with *AS 3580.10.1-2003*.

Annual average levels of insoluble solids (i.e. dust deposition) are presented in Chart 4. Chart 5 provides a comparison between annual average dust deposition levels at each of the monitoring sites from 2014 to 2022.

Monthly data that is highly contaminated (e.g. from bird droppings, insects or proximal construction works) has been excluded from annual average dust deposition levels. Notably, the calculated levels for gauge D3 excludes 11 monthly recordings, the calculated levels for gauge D4 excludes four monthly recordings and the calculated levels for gauge D7 excludes four monthly readings. There are no privately-owned receivers in the vicinity of gauges D8 and D14. Whilst these sites do not represent residence(s) on privately-owned land, they will continue to be monitored in accordance with the AQGGMP.

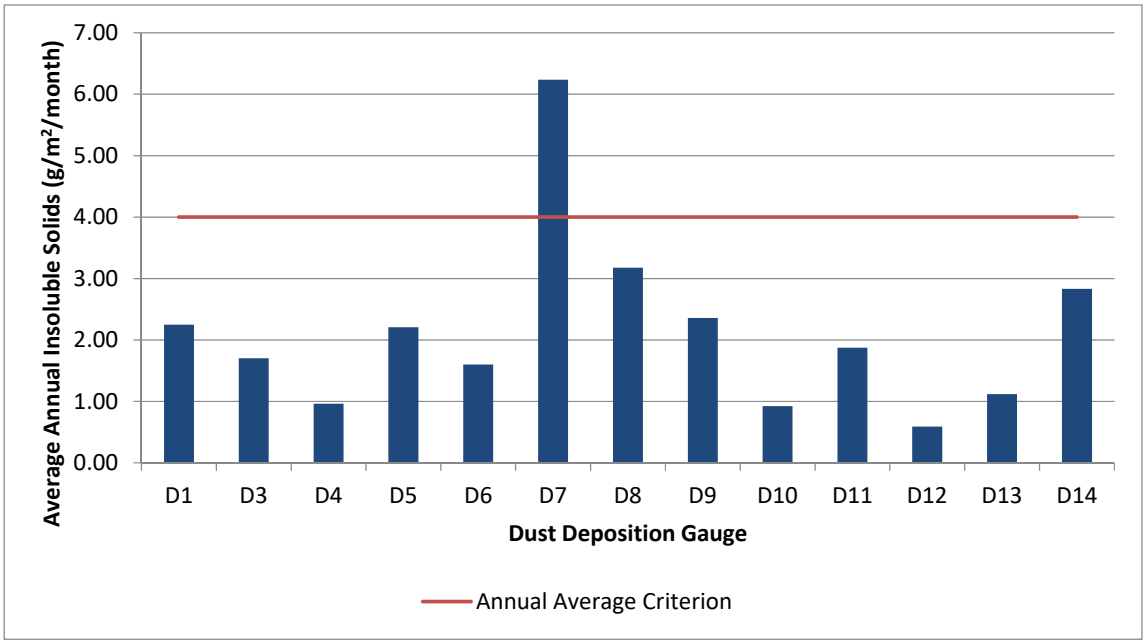
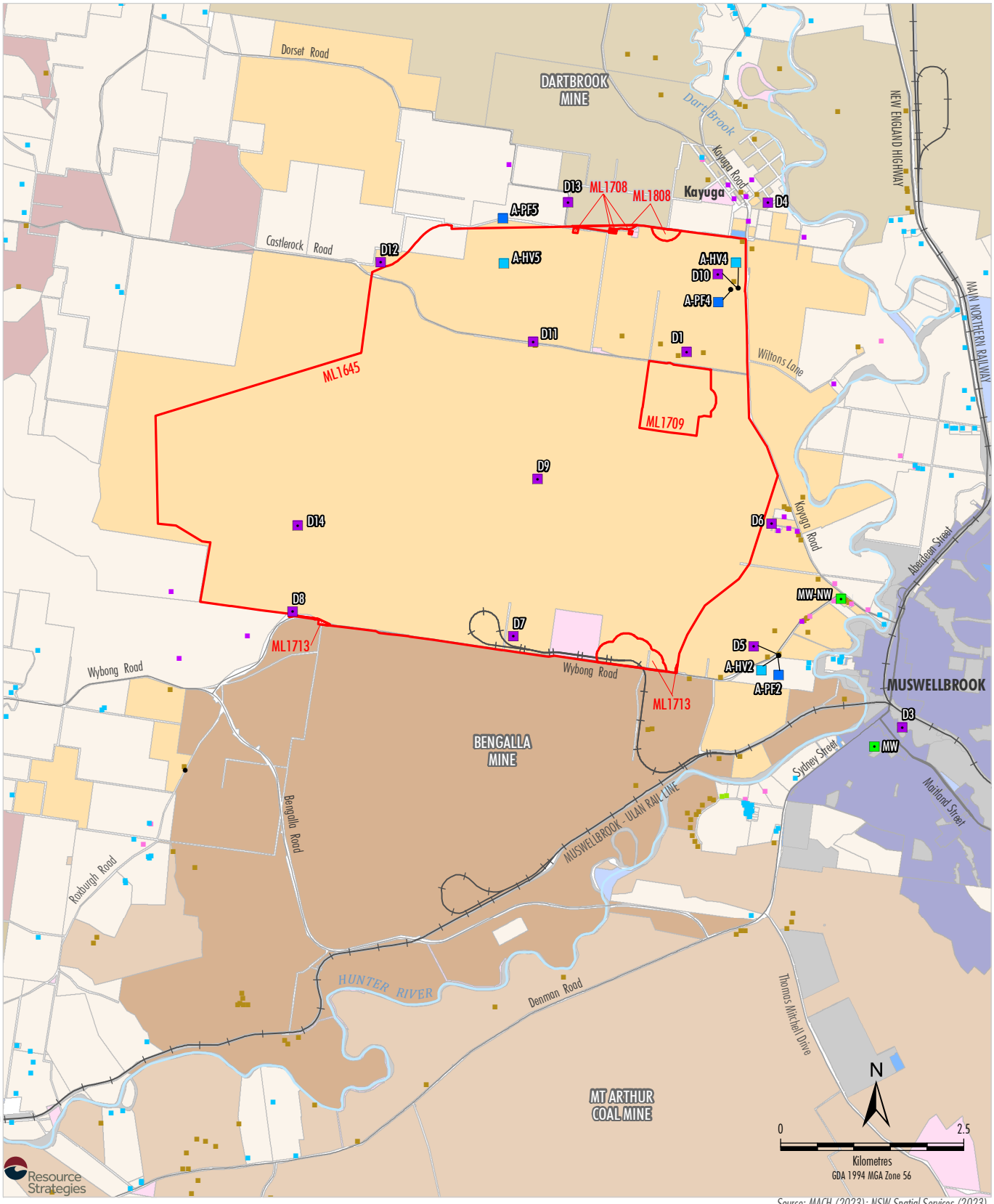


Chart 4: 2022 Annual Average Insoluble Solids



Source: MACH (2023); NSW Spatial Services (2023)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1

Category of Rural Residence under DA92/97

- Mine-owned
- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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Air Quality Monitoring Sites

Figure 5

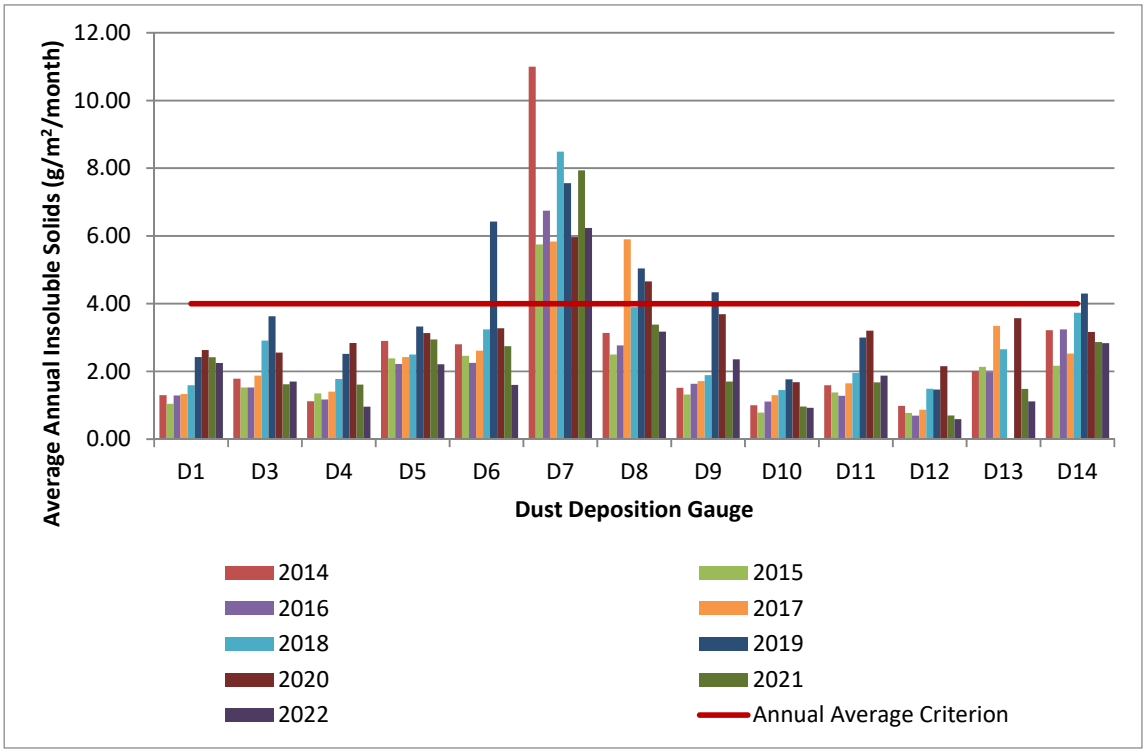


Chart 5: 2014 - 2022 Annual Average Insoluble Solids

PM_{10} and $PM_{2.5}$

Palas Fidas monitoring systems were installed at three locations (Figure 5) in late 2016. The Palas Fidas systems collected PM_{10} and $PM_{2.5}$ data continuously, which was averaged over 24 hours (Chart 6 and Chart 7) and annually (Chart 8 and Chart 9).

The data presented excludes 'extraordinary events', consistent with Condition 20, Schedule 3 of Development Consent DA 92/97. There were three days with elevated readings during adverse weather conditions in 2022.

No 'extraordinary events' occurred during the reporting period. The elevated PM_{10} measurement of 61 µg/m³ on 17 January 2022 was not suspected to be an incremental increase as a result of mining operations at the MPO as APF2 was not downwind. The elevated PM_{10} measurement of 104 µg/m³ and 56 µg/m³ on 12 November 2022 and 12 December 2022, respectively, was not suspected to be an incremental increase as a result of mining operations at MPO due to the estimated maximum contribution being less than or equal to 1.5 µg/m³ and 40.2 µg/m³, respectively.

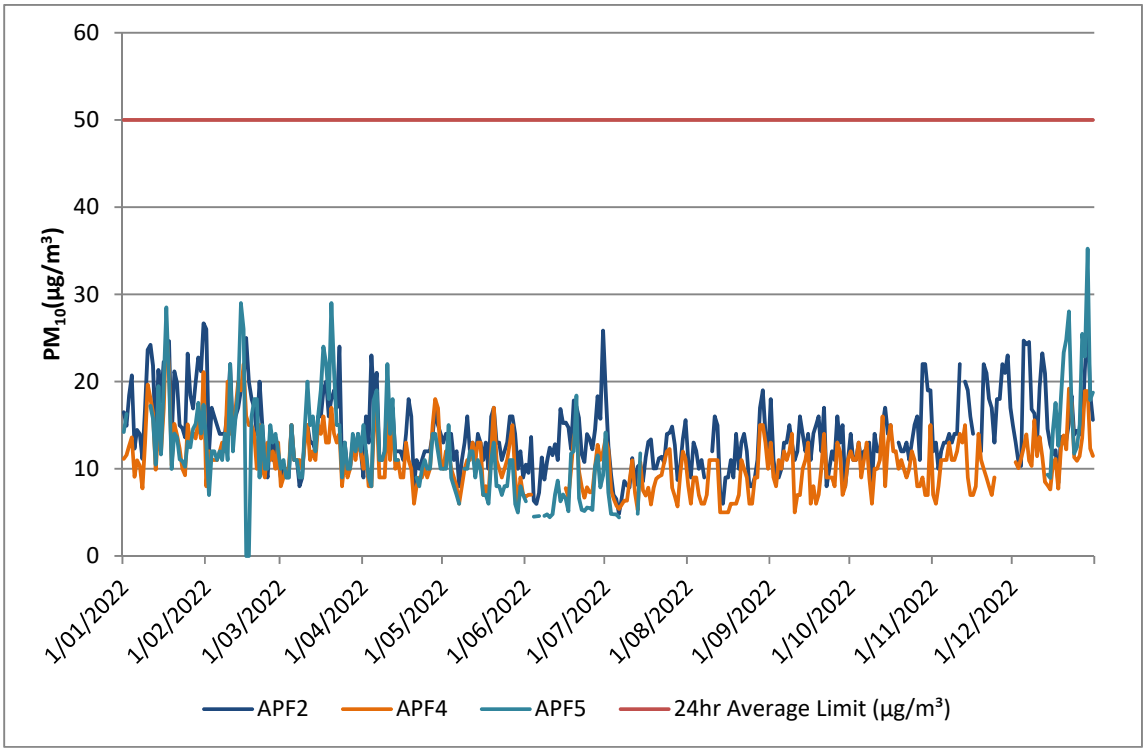


Chart 6: 24-hour Average PM_{10} Levels

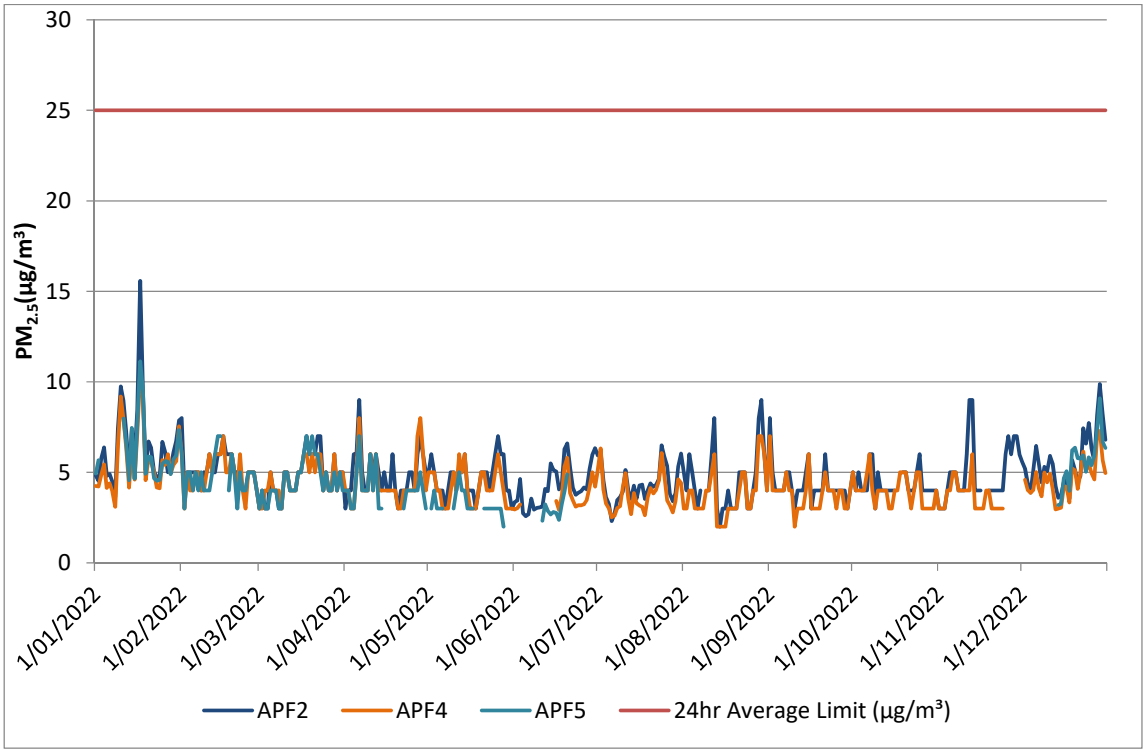


Chart 7: 24-hour Average $PM_{2.5}$ Levels

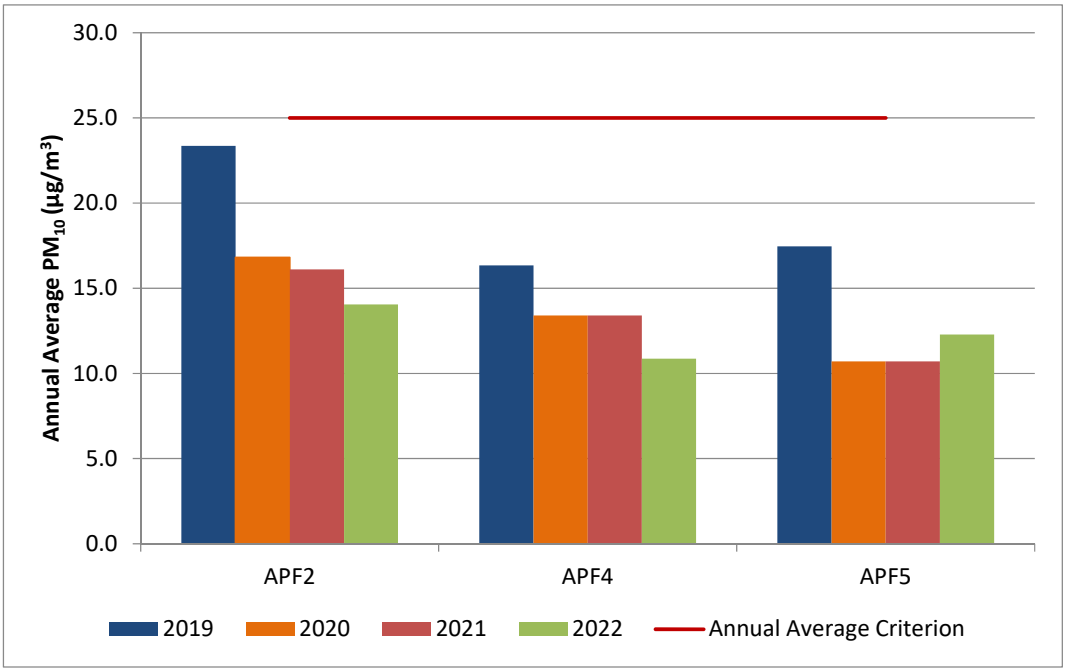


Chart 8: Annual Average PM_{10} Levels

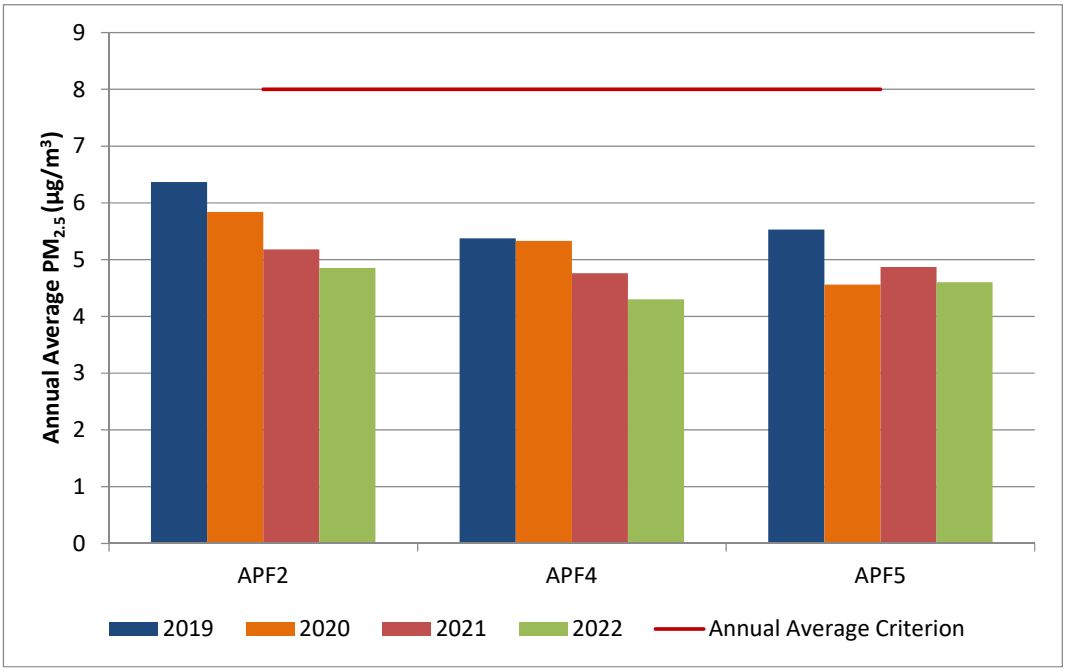


Chart 9: Annual Average $PM_{2.5}$ Levels

Total Suspended Particulate

TSP levels were recorded at the three High Volume Air Sampler (HVAS) systems (A-HV2, A-HV4 and A-HV5) located adjacent to the three Palas Fidas monitors (Figure 5). These HVAS systems were sited in conjunction with the Palas Fidas monitors in late 2016. Annual average TSP levels are presented in Chart 10.

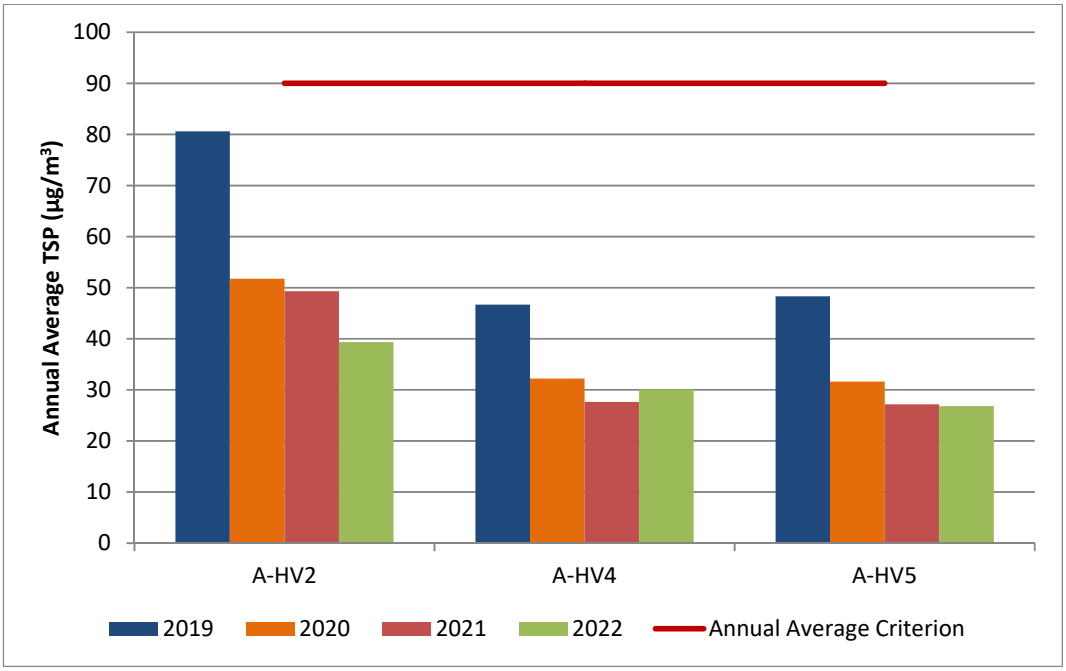


Chart 10: Annual Average TSP Levels

Complaints

Only one air quality-related complaint was received by MACH Energy during 2022 in comparison to the 22 complaints received in the 2021 reporting period (see Complaints Summary 2022: https://machenergyaustralia.com.au/mount-pleasant/documentation/). In response to the complaint, particulate matter levels at nearby monitoring locations were reviewed and a letter was sent to the complainant advising that the MPO was unlikely to be the main contributor as there are two other operations in two locations directly east of the complainant's residence.

5.4.3 Trends and Key Management Implications

Dust Deposition

Dust deposition levels decreased between 2021 and 2022 at most dust deposition gauges at the MPO. The decrease in dust deposition levels is likely to have been influenced, at least in part, by the above average rainfall observed across 2022. Annual average levels of deposited dust were recorded above the long-term impact assessment criteria of 4 g/m^2/month at D7.

D7 is located within the MPO boundary between the MPO and a neighbouring mining operation (Figure 5). Due to its proximity to the northern boundary of the main pit of the neighbouring mining operation, D7 is directly influenced by both the MPO and the neighbouring mining operation. Therefore, whilst this site has continued to be monitored, it is not used to assess compliance or to represent residential receivers in the area.

Todoroski Air Sciences (TAS) reported in the 2022 Annual Air Quality Review that the MPO was generally compliant with the relevant criterion for dust deposition (Table 16) for this reporting period (TAS, 2022).

PM_{10} and $PM_{2.5}$

The measured 24-hour average PM_{10} levels were below the Project only criterion during the reporting period.

Chart 6 shows that PM_{10} levels fluctuated at the three monitors throughout the year, with no apparent trends other than APF2 generally recording higher levels than APF4 and APF5. APF5 had no recorded data for PM_{10} levels from August to December due to power issues and a rodent infestation. Chart 8 indicates annual average PM_{10} levels slightly decreased between 2021 and 2022.

Real-time monitoring of $PM_{2.5}$ was also undertaken during the reporting period at the three monitors (Figure 5). The measured cumulative 24-hour average $PM_{2.5}$ levels were below the relevant criteria during the reporting period.

Chart 7 shows that $PM_{2.5}$ levels fluctuated at the three monitors throughout the year, with no apparent trends. APF5 had no recorded data for $PM_{2.5}$ levels from August to December due to power issues and a rodent infestation. Chart 9 indicates annual average $PM_{2.5}$ levels slightly decreased between 2021 and 2022.

TAS reported in the 2022 Annual Air Quality Review that the MPO was generally compliant with the relevant criteria for both annual and 24-hour average levels for PM_{10} and $PM_{2.5}$ (Table 16) for the reporting period (TAS, 2022).

Total Suspended Particulate

The annual average TSP levels based on the measured TSP levels were compliant with the annual average TSP criterion during the reporting period. Chart 10 indicates annual average TSP levels slightly decreased between 2021 and 2022.

TAS reported in the 2022 Annual Air Quality Review that the MPO was generally compliant with the relevant criterion for TSP (Table 16) for this reporting period (TAS, 2022).

Greenhouse Gas Emissions

In accordance with Condition 19, Schedule 3 of Development Consent DA 92/97, MACH Energy has implemented all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site.

The primary source of GHG emissions at the MPO is the release of carbon dioxide (CO_2) and methane (CH_4) during the combustion of diesel fuel. Fugitive emissions of CO_2 and CH_4 during the use of explosives will be minor in comparison to diesel combustion emissions.

Greenhouse gas emissions at the MPO are minimised through efficient use of diesel fuel by the mobile fleet. A significant number of new mobile plant fleet were commissioned during the reporting period as part of a new fleet. A list of the new mobile plant is provided in Table 17.

Efficient diesel use is promoted by:

- Optimising the design of haul roads to minimise the distance travelled between the pit and the CHPP.
- Minimising the re-handling of material (i.e. coal, overburden and topsoil).
- Maintaining the fleet in good operating order.

A discussion of the comparative ROM production, diesel consumption, use of oil and grease and the greenhouse gas emissions reported under the National Greenhouse and Energy Reporting Scheme (NGERs) for 2022 financial year and MOD 3 predictions is provided below.

Table 17
New Mobile Plant Fleet Summary

Fleet Description	Quantity	Status
Cat 24	1	At work
Komatsu D475A-8	4	
Cat 793D with tray	1	
Cat MD6250	2	
Cat 994K	1	
Komatsu D375A-8	5	
Komatsu 930E	6	
Komatsu PC1250	1	
Cat 773GST	1	
PC 7000	1	
793 Hire	2	
Tyre Handler	1	
Cat 18 GR1468	1	
Cat 24 GR1471	1	
Liebherr R9600	2	
Cat 18 GR1469	1	Expected delivery next reporting period
Liebherr R9400	1	Expected delivery next reporting period
MPU	1	Expected delivery next reporting period

A summary of ROM production, diesel consumption, use of oil and grease and the greenhouse gas emissions reported under the NGERs for 2022 financial year are shown in Table 18. The associated estimated GHG emissions presented in MOD 3 EA (*Mount Pleasant Operation Mine Optimisation Modification Air Quality and Greenhouse Gas Assessment* [TAS, 2017]) are also shown in Table 19.

NGERs is based upon financial year reporting, and the TAS (2017) greenhouse gas estimates are based on calendar years. This Annual Review reports on the 2022 financial year data, as reported in NGERs. Table 18 includes references to the fugitive emission factors adopted in the TAS (2017) assessment and those reported in the NGERs, which vary materially.

Comparison to MOD 3 Predictions

MOD 3 predictions for air quality were modelled for three scenarios during the mine life (i.e. Year 2018, Year 2021 and Year 2025). Monitored annual average levels of insoluble solids, TSP, PM_{10} and $PM_{2.5}$ were generally below the MOD 3 Scenario 1 and 2 predictions.

Any inconsistencies observed between the monitoring results and the MOD 3 predictions are likely to be due to the inherent uncertainty associated with predictive modelling (e.g. activities may not occur in the same location, or at the same magnitude, as anticipated when developing predictive models). Further, the sensitive receptors (residences) are generally not located immediately adjacent the nearest monitoring sites (e.g. monitoring sites may be located closer to mining activity).

Greenhouse Gas Emissions

ROM coal production was generally below the rate estimated in TAS (2017) (MOD 3 EA), as the ramp up in coal production in practice was slower than anticipated. This was due to a number of factors, including a longer than anticipated construction period for the CHPP.

Site diesel emissions are similar between the TAS (2017) estimates and actual consumption rate (Tables 18 and 19), and the oil and grease consumption were marginally more than predicted in the TAS (2017) assessment.

It is noted that the delay in commissioning of the CHPP necessarily altered the sequence of mining to prioritise coals that could be sold as a CHPP bypass product, and this contributed to lower mining efficiency, and hence may have contributed to more diesel consumption per ROM tonne.

For an open cut coal mine, the predicted fugitive greenhouse gas emissions are calculated by multiplying the estimated ROM coal production by an emissions factor.

The MOD 3 EA predicted fugitive greenhouse gas emissions using a site-specific average emissions factor of 0.012 tonnes of carbon dioxide equivalent per ROM tonne of coal (tCO_2-e/ROM t) (Rio Tinto Coal Australia Pty Limited [Rio Tinto], 2012).

This emissions factor was derived from data collected from some 13 gas-content boreholes completed by the former owner of the project (two gas holes drilled in 2006, seven in 2010 and four holes in the adjacent Bengalla Mine) (Rio Tinto, 2012). It is noted that this estimate was based on a methane Global Warming Potentials (GWP) of 21, which was the relevant warming potential adopted at that time. The current methane GWP used from 2020 – 2021 onwards is 28 (Clean Energy Regulator, 2022).

In accordance with *Method 1 National Greenhouse and Energy Reporting (Measurement) Determination 2008*, the fugitive greenhouse gas emissions reported by the MPO via NGERs were estimated using default emission factors from the National Greenhouse Accounts Factors (NGA Factors).

For open cut coal mines in NSW, the default emission factor was 0.054 (tCO_2-e/ROM t) in the NGA Factors 2015 to 2019 and was increased to 0.061 (tCO_2-e/ROM t) in the NGA Factors 2020 to 2022. These NGA default factors are significantly higher than the site-specific factor (i.e. 0.012 tCO_2-e/ROM t) calculated by Rio Tinto in 2012, and used by TAS in 2017. In 2022, MACH Energy commissioned CoalBed Energy Consultants in 2022 to re-evaluate the fugitive emission factor based on the revised GWP of methane. In conducting this work, the revised estimated fugitive emission factor was determined to be approximately 0.020 tCO_2-e/ROM t (CoalBed Energy Consultants, 2022). Further works associated with the site-specific factor are still being conducted with additional data being acquired and analysed. MACH Energy will report any further amendments to site-specific emission factors as they arise in the following reporting periods.

Table 18
MPO Emissions Summary Financial Year 2022

Financial Year	ROM (t)	Diesel Consumption (kL)	Fuel Oil/Petroleum Based Oils and Greases Consumption (kL)	Fugitive Scope 1 emissions (t CO_2-e)	Diesel Scope 1 emissions (t CO_2-e)	Fuel Oil/Petroleum Based Oils and Greases Scope 1 emissions (t CO_2-e)
2022	10,079,655	37,635	1,273	614,859[1]	101,982	293

Note:

t = tonnes; kL = kilolitres and tCO_2-e = tonne of Carbon Dioxide equivalent.

[1] Fugitive emission factor was 0.061 (DCCEEW, 2021).

Table 19
MOD 3 Predictions Emissions Summary 2021 and 2022

MOD 3 EA Prediction Year	ROM (t)	Diesel Consumption (kL)	Fuel Oil/Petroleum Based Oils and Greases Consumption (kL)	Fugitive Scope 1 emissions (t CO_2-e)	Diesel Scope 1 emissions (t CO_2-e)	Fuel Oil/Petroleum Based Oils and Greases Scope 1 emissions (t CO_2-e)
2021	10,500,001	31,279	1,387	126,000[1]	85,120	4,065
2022	10,500,001	27,251	1,208	126,000[1]	74,159	3,541

Note:

[1] Fugitive emission factor was 0.012, calculated inclusive of a GWP for methane of 21 (Rio Tinto, 2012).

The differences in the fugitive emission estimates between TAS (2017) and MACH Energy NGERs reporting arise primarily due to differing methodologies and associated emission factors being employed under the differing regulatory systems (i.e. NGERs reporting under the *Commonwealth National Greenhouse and Energy Reporting Act 2007* using NGA default emission factors, and environmental assessment under the NSW *Environmental Planning and Assessment Act 1979* using site-specific emissions data), plus periodic revisions to the GWP of methane, which is a large component of the fugitive emissions from coal mines.

Air Quality Review

TAS was commissioned by MACH Energy to complete an air quality review at the MPO for 2022. The air quality review is provided in Appendix D.

The review concluded that the MPO was fully compliant with the relevant air quality criteria (Condition 20, Schedule 3 of Development Consent DA 92/97).

5.4.4 Implemented or Proposed Management Actions

In accordance with Conditions O3.4 and O3.5 of EPL 20850, all dust generating activities at the MPO must be ceased when specific adverse conditions are identified at the on-site meteorological station and/or at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network monitor.

Dust generating activities were discontinued on one occasion during 2022 in accordance with Conditions O3.4 and O3.5 of EPL 20850. Operations were ceased on 13 December 2022 in response to the generation of visible dust, for a total of 53 minutes across the mining fleet. The reduction in these hours compared to the previous reporting period was due to the above average rainfall received during the reporting period.

All appropriate steps to reduce dust generation were undertaken in accordance with the MPO AQGGMP, consistent with Condition 23, Schedule 3 of Development Consent DA 92/97. MACH Energy will continue to implement these dust mitigation measures.

5.5 BIODIVERSITY

A BioMP was prepared by MACH Energy in accordance with Condition 32, Schedule 3 of Development Consent DA 92/97 and approved on 31 October 2019.

5.5.1 Approval Criteria and Management Plan Requirements

MACH Energy implements biodiversity management actions in accordance with the approved BioMP. In order to ensure appropriate management actions are applied, and to evaluate the vegetation and fauna habitat condition at the MPO, the BioMP implements a Biodiversity Monitoring Program. The program includes the following components to maintain the remnant vegetation across the MPO area:

- tree clearing supervision;
- fauna relocation / spotter catcher;
- weed monitoring;
- vertebrate pest monitoring;
- monitoring of access; and
- rehabilitation monitoring.

5.5.2 Implemented or Proposed Management Actions

In 2022, the following biodiversity related management actions were undertaken:

- Weed control measures carried out by Enright Land Management and other contractors on various properties within MPO and adjoining properties. Weeds found on the properties were sprayed or manually removed. These included Galenia Pubescens, Bathurst Burr, Saffron Thistle, Mother of Millions, Fat Hen and White Goosefoot.
- Pest control measures implemented by Enright Land Management and other contractors on various properties within the MPO and adjoining properties. These included wild dog and fox baiting which occurred during September and October 2022 (Enright Land Management, 2022).
- Pre-clearance surveys undertaken by MACH Energy Environmental Advisor and/or an ecologist consultant including:
  - surveys for the ongoing mining operation;
  - habitat tree pre-clearance survey for the HWD2 construction works area including associated 22 kV electrical works due to expansion to the west;
  - surveys for the MOD 4 construction works areas; and
- Clearing supervision was undertaken by a MACH Energy Environmental Advisor and/or an ecologist consultant (Umwelt), which included fauna management (i.e. spotter catching) and habitat tree felling supervision.
- One squirrel glider (*Petaurus norfolcensis*) was recorded during clearing activities at the HWD2 powerline project.

- Following the Tiger Orchid (*Cymbidium canaliculatum*) translocation program in 2021, an annual Tiger Orchid monitoring program was undertaken in 2022. The Tiger Orchids ranged in health, with a majority of the most recently translocated individuals having browned foliage, while the older orchids had abundant green foliage. Recommended management actions were proposed to monitor the health of the translocated orchids (Narla Environmental, 2022).
- Connectivity planting between the site rehabilitation and the Hunter River riparian zone vegetation was undertaken.
- Annual, bi-annual and regular monitoring was carried out by MACH Energy.

Biodiversity Offsets

The MPO Development Consent DA 92/97 was granted in December 1999, prior to the implementation of offsetting policies in NSW. While no biodiversity offsets were required for the original development under Development Consent DA 92/97, biodiversity offsets were established for the existing /approved MPO under the Commonwealth approval (EPBC 2011/5795).

EPBC Approval 2011/5795 was varied during the reporting period in regard to the Biodiversity Management Areas (BMA) and their security.

MACH Energy is pursing continuing to work with DCCEEW to finalise a Conservation Agreement (under Part 14 of the EPBC Act) to secure the BMAs.

The BMAs are managed by MACH Energy in accordance with an offset management plan, approved by DCCEEW in 2015 and varied from time to time to reflect management updates from MACH and requests from DCCEEW.

During the reporting period, MACH Energy is in the process of seeking Biodiversity Stewardship Agreements for additional offset areas. As at 31 December 2022, this is currently in consultation with the Credit Supply Taskforce and securement of this offset area will be discussed in the next reporting period.

5.6 HERITAGE

MACH Energy manages Aboriginal heritage on-site in accordance with Aboriginal Heritage Impact Permits (AHIPs) (i.e. AHIPs #C0002053, #C0002092 and #C0004783) issued by the Heritage NSW within the NSW Department of Premier and Cabinet, and in accordance with the approved AHMP, prepared in accordance with Condition 36, Schedule 3 of Development Consent DA 92/97.

5.6.1 Approval Criteria and Management Plan Requirements

During the reporting period, all Aboriginal heritage management activities were carried out in accordance with the AHMP. The AHMP contains a range of management measures related to recording and surface collection, archaeological excavation, artefact analysis, artefact management, archaeological salvage, archaeological monitoring, and an Aboriginal conservation strategy.

5.6.2 Implemented or Proposed Management Actions

During the reporting period, the following on-ground management measures relevant to heritage (Aboriginal and historic heritage) were undertaken at the MPO:

- Surface salvage collection for Aboriginal artefacts within AHIP #C0002053 area undertaken in August 2022.
- Aboriginal cultural heritage survey and surface salvage of the Go-Line under the approved AHIP #C0002053 area undertaken in December 2022.
- The following Aboriginal Objects Due Diligence Assessments were undertaken:
  - Assessment for the proposed Broomfield Gully Erosion Repair undertaken by Niche Environment in May 2022.
  - Assessment for the proposed Northern Core Drilling Program undertaken by Niche Environment in June 2022 and September 2022.
  - Assessment of the Sandy Creek Erosion undertaken by Niche Environment in August 2022 and September 2022.
- The annual meeting with Registered Aboriginal Parties (RAPs) was undertaken to provide a general update on the management of Aboriginal heritage in September 2022.
- Annual inspection of cultural heritage sites in December 2022.
- Transfer of Aboriginal objects within AHIP #C0002053, AHIP #C0004783 and AHIP #C0002092 from the Broomfield Homestead Complex to Ascot Farm under a Care Agreement.
- Ongoing progression of suitable arrangements to provide appropriate long-term security for the Aboriginal Heritage Conservation Area (Areas B and C), including liaison with Heritage NSW and the RAPs for an alternative artefact keeping place and proposing Aboriginal Cultural Heritage survey of select biodiversity offset areas to potentially identify alternatives.
- Ongoing conservation management works at the Negoa Homestead including structural works and removal of non-heritage components.
- Ongoing update of the MPO Aboriginal Site Database and Geographic Information System (GIS) data.
- The security of Aboriginal Heritage Conservation Area A is being progressed in consultation with DPE and will be reported in the next reporting period.

During the next reporting period, MACH Energy anticipates undertaking the following heritage works:

- Annual inspection of cultural heritage sites.
- Ongoing surface salvages as required.
- Continuation of consultation regarding the Aboriginal Heritage Conservation Areas B and C.
- Continue to undertake appropriate conservation management works at the Negoa Homestead.
- The transfer of Aboriginal objects within AHIP #C0002053, AHIP #C0004783 and AHIP #C0002092 from the Broomfield Homestead Complex to Ascot Farm under the Care Agreement.

5.7 EXPLORATION

No exploration activities were conducted during this reporting period.

5.8 WASTE

Operational waste data was collected during the reporting period by the waste contractor and is presented in Table 20. A waste tyre in-pit burial campaign was undertaken in March 2022 with the majority of the tyres disposed of in Pit B. All waste tyres were disposed in accordance with Condition O6 of EPL 20850.

All waste levels have remained generally consistent between 2021 and 2022.

The WasteMP contains management measures on waste storage, segregation, transport and disposal, as well as provisions for waste monitoring. The latest version of the WasteMP was approved by DPE on 14 January 2019.

The FEA Review was undertaken in 2022 as per the approved WasteMP. The review found that the implementation of the adopted fine rejects emplacement strategy based on hydraulic transport and deposition into the current FEA has been broadly effective and this strategy will remain in effect until at least the end of December 2026. Currently, it is not feasible to undertake an in-pit fines emplacement area nor to use mechanical dewatering to support the co-disposal of tailings with coarse rejects. However, it was recommended that MACH Energy consider additional dewatering with any subsequent CHPP upgrades (ATC Williams, 2022).

5.9 TOPSOIL MANAGEMENT

MACH Energy currently estimates that approximately 1,672,450 cubic metres (m^3) of topsoil is required for final landform rehabilitation and therefore, MACH Energy is aiming to directly apply or stockpile this amount prior to mine closure. During the reporting period, topsoil stockpiles were located adjacent to active disturbance areas and areas to be rehabilitated, as shown on Figure 6. A total of approximately 2,181,622 m^3 of topsoil was stored in stockpiles during the reporting period. This, in accordance with the RMP, is approximately 237,541 m^3 less than the volumes anticipated at the end of August 2023. However, sufficient soil resources are available for final landform rehabilitation. A topsoil register with individual volumes for each stockpile is kept and maintained on-site.

Topsoil was stripped ahead of disturbance activities and where possible, placed onto rehabilitation areas immediately. Where it was impractical to respread topsoil immediately it was stockpiled, and sign posted. The stockpiles were then shaped, ripped and direct seeded with a species mix containing sterile pasture species, native grass and shrub tree seed to maintain seed reserves and microbial soil associations.

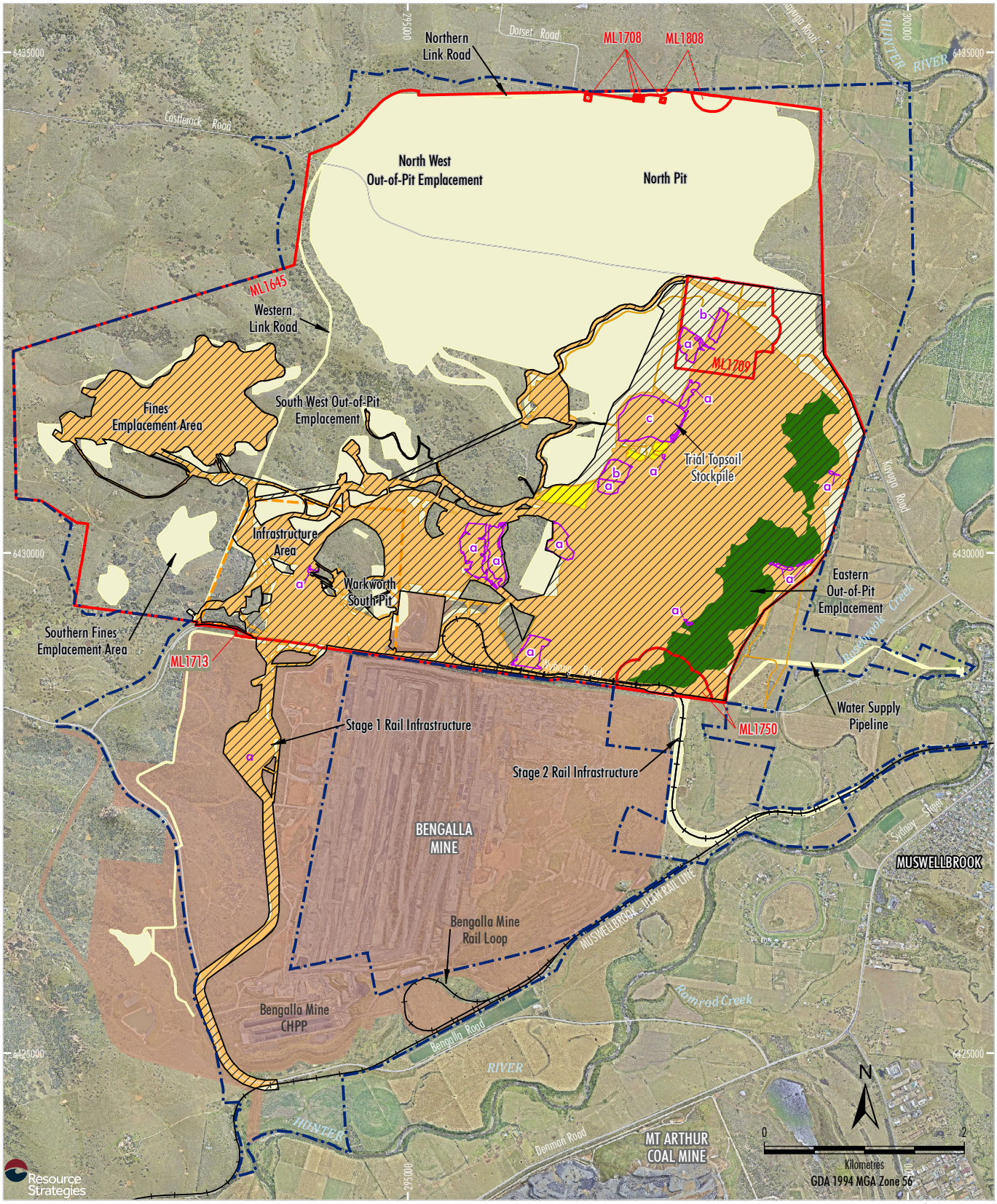
During the reporting period, MACH Energy continued the topsoil stockpile research trial that aims to assess the effectiveness of the MPO's 'Soil Stockpile Management' practices and the 'Soil Replacement on Rehabilitation Areas' practices as outlined in the RMP. The overarching aim for soil stockpile management at the MPO is to maintain soil viability, seed reserves and microbial soil associations to assist successful rehabilitation outcomes at the MPO.

Table 20
MPO Waste Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
General Waste (t)	22.68	22.84	28.13	24.13	22.35	27.69	21.35	42.78	45.90	30.96	31.47	20.91	341.19
ACM[1] (t)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Recycled Waste (t)	6.67	32.20	41.32	19.88	12.76	30.10	31.82	7.88	25.11	34.57	37.56	20.80	300.67
Liquid Effluent (kL)	117.5	133.0	147.0	317.0	208.5	123.0	160.6	140.5	135.5	79.50	98.5	96.0	1756.6

Note:

[1] Asbestos is managed in accordance with an internal Asbestos Control Plan. All asbestos removal work is handled with appropriate respiratory protective equipment and is supervised by a competent person approved by SafeWork NSW. Asbestos is transported off-site and disposed of at a lawful disposal facility licensed by EPA.



LEGEND

- Mining Lease Boundary
- Development Consent Boundary
- Approximate Extent of Existing/Approved Surface Development (DA92/97) [1]
- Infrastructure Area Envelope
- RMP 2022 Footprint [2]
- a — End 2022 Topsoil Stockpile Location (3 m)
- b — End 2022 Subsoil Stockpile Location (3 - 5 m)
- c — End 2022 Trial Topsoil Stockpile Location (5 m)
- End 2022 Active Disturbance Area
- End 2022 Rehabilitation Area
- 2023 Forecast Additional Disturbance Area
- Bengalla Mine Approved Disturbance Boundary (SSD-5170)

NOTES

[1] Excludes some incidental Project components such as water management infrastructure, infrastructure within the Infrastructure Area Envelope, offsite coal transport infrastructure, road diversions, access tracks, topsoil stockpiles, power supply, temporary offices, signalling, other ancillary works and construction disturbance.

[2] Mount Pleasant Operation Rehabilitation Management Plan (July 2022)

Source: MACH Energy (2023); NSW Spatial Services (2023); Department of Planning and Environment (2016) Orthophoto: MACH Energy (Dec 2022)

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Topsoil Stockpile Locations

Figure 6

MACH Energy has engaged the University of Newcastle to design and undertake the topsoil stockpile trial. The trial involves microbial sampling and soil testing at one 5 m high Trial Topsoil Stockpile's (refer Trial Topsoil Stockpile on Figure 6) and at six other 3 m high control topsoil stockpiles. The study involves a comparison of the results from 5 m high trial stockpiles against the results from the 3 m high control stockpiles. The results from the trial will be used to inform soil stockpile management practices at the MPO and improve the soil ecosystem on MPO rehabilitation areas.

Microbial and soil sampling and analysis has commenced for four control 3 m high soil stockpiles, one 5 m high Trial Topsoil Stockpile, and a recently stripped site. Topsoil stockpiles were sampled using hammer and core method (except recently stripped site which was bulk sampled). Sampled stockpile depth ranged from 1 m to greater than 5 meters during the sampling. Sampling was undertaken during November 2021 and February 2022, with the aim to sample topsoil stockpiles to maximum depth, to gain soil property and microbial biomass observations from varying depths.

The July 2021 – May 2022 results of the topsoil stockpile research trial indicate that the majority of soil properties (both chemical and physical) were found to have no correlation with stockpile depth across all sample sites. Exchangeable nutrient and micronutrients were found to vary greatly across the site. Total carbon was significantly lower at the 5 m trial stockpile at Pit E. No correlations between total carbon and depth were observed across the site however, suggesting that this is more a function of a pre-stripped soil heath than a result of greater stockpile depths. Soil microbial biomass was shown to have a significant linear decrease with increasing stockpile depth at four of the six stockpiles. Further sampling is needed to further investigate total carbon differences between 5 m stockpiles and 3 m stockpiles. Future sampling is also necessary to assess the influence of stockpile age on microbial biomass populations.

The last samples for the topsoil stockpile trial were taken in November 2022.

The results from the remainder of the 2022 and 2023 sampling rounds are expected to be available in the next reporting period.

5.10 VISUAL AMENITY AND LIGHTING

A VIMP was prepared by MACH Energy in accordance with Condition 47, Schedule 3 of Development Consent DA 92/97 and approved on 31 October 2019. A revision of the VIMP was prepared to include additional details regarding visual impact management measures relevant to MOD 4 rail infrastructure following completion of detailed design and approval of the CEMP. Following submission, comments were received on 7 September 2022 from the DPE. The VIMP was then updated and re-submitted on 28 October 2022 to address DPE comments. The revised VIMP is currently awaiting approval as at 31 December 2022. This Annual Review reports against the currently approved VIMP (approved on 31 October 2019).

The VIMP describes MACH Energy's management approach to minimising visual amenity and lighting impacts on surrounding receivers.

Visual landscaping activities were undertaken during the reporting period. These included:

- tree planting of approximately 10,000 trees collectively during Autumn and Spring 2022 in the following areas:
  - tree screen infill planting along key roads with views of the MPO such as Kayuga and Wybong Roads;
  - tree planting along the main MPO site entrance, access road, operations office carpark and infrastructure areas (Rail Loop 2 Train Load-Out);

  - tree planting along the eastern portion of ML 1645; and
  - tree planting along the Hunter River fauna connectivity area;
- implementation of visual bunding/tree screen planting along the CHPP road on the western edge of the ROM coal storage area;
- continued extension of visual barrier fencing along Wybong Road adjacent to the CHPP; and
- general maintenance of the abovementioned areas.

Targets for visual landscaping growth and survival rates were achieved for 2022 (Plate 1) due to increased rainfall. Higher than normal survival rates were observed with mature trees recording approximately 95% or less and younger trees approximately 60% or less. During the reporting period, contractors were employed to undertake maintenance of visual landscaping including weeding, slashing, and re-tying more mature trees that are exposed to wind (near the entrance to the Mining Infrastructure Area) to stakes.

Plate 1: Visual Landscaping Growth Progress Update

During the reporting period, MACH Energy commissioned an external consultant to undertake lighting audits as part of the commissioning of the MOD 4 rail. The VIMP was then updated to include additional details regarding visual impact management measures relevant to MOD 4 rail infrastructure and has incorporated the outcomes of the final lighting audit. This includes establishment of train lighting screens, additional screen planting and routine visual inspections of light screens. This version of the VIMP was submitted to DPE on 28 October 2022 and as at 31 December 2022, the revised VIMP was awaiting approval. The findings from this audit will be discussed in the next reporting period.

MACH Energy is in the process of undertaking light audits as part of the commissioning of the relocated rail. These audits may result in additional light management being proposed and installed. This will be discussed in the next reporting period.

Only one visual-related complaint was received by MACH Energy during 2022, in comparison to the 16 visual-related complaints received in 2021 (see Complaints Summary 2022: https://machenergyaustralia.com.au/mount-pleasant/documentation/). In response to the complaint, an investigation was triggered. Following the investigation, the lighting plant in the North Pit was repositioned to point further to the west.

5.11 CONTAMINATED LAND

No contaminated land was found during the reporting period.

5.12 SPONTANEOUS COMBUSTION MANAGEMENT

Inspections of coal stockpiles for spontaneous combustion were undertaken regularly. There were two reportable spontaneous combustion events at the MPO during the reporting period.

A complaint was received on 6 May 2022 in relation to spontaneous combustion at the MPO. The area in question was continually inspected, with dozers tasked to cover the heated area with inert material. The area has since been covered and the event eliminated.

A spontaneous combustion complaint was received on 15 July 2022, specifically noting both visual smoke and odour along Wybong Road. The MPO mining contractor's Environment and Community Superintendent undertook a review of the CCTV footage recorded at MPO on 14 and 15 July 2022. A small amount of smoke was identified in the Northern Pit. The heated material cooled overnight, and no recurrence was observed on the following day. Areas of heated material at MPO are managed in accordance with the Spontaneous Combustion Principal Hazard Management Plan, which has been developed in accordance with current industry best practice. Routine offsite inspections were conducted from Wybong and Kayuga Road on 14 and 15 July. No spontaneous combustion was visible, or odour detected during these inspections. On 3 August 2022, MACH Energy responded to the request for additional information from EPA (via email on 27 July 2022) regarding techniques used to identify areas of heated material at the MPO. On 29 August 2022, correspondence from the EPA stated that no further information was required.

A total of three complaints that mentioned spontaneous combustion were received by MACH Energy during 2022 in comparison to the four spontaneous combustion complaints received in 2021 (see Complaints Summary 2022: https://machenergyaustralia.com.au/mount-pleasant/documentation/). In response to each complaint, an investigation was triggered. Following the investigation, the External Relations Manager made further contact with the complainant to provide an update on how MACH Energy has addressed the issue of the complaint.

5.13 GEOCHEMISTRY

MACH Energy undertook Acid Mine Drainage (AMD) test assessment works during the previous reporting period. The testing program supported the results of the geochemical characterisation completed at the MPO during 2020 (RGS, 2020), which indicated that most samples representing overburden and interburden materials were classified as Non-Acid Forming (NAF) materials. The materials represented by these samples were confirmed to have a low risk of generating AMD (Klohn Crippen Berger [KCB], 2021). Consistent with the known depositional environment, the occurrence of Potentially Acid Forming (PAF) material was limited to the Bayswater-Wynn interburden (Archerfield Sandstone), Wynn interburden (roof, floor and parting) and coarse rejects derived from processing the Wynn seam (KCB, 2021).

During the 2022 reporting period, KCB was commissioned by MACH Energy to provide support for the ongoing geochemical assessment of the overburden tailings and coal rejects on site in 2021 and 2022. KCB undertook additional AMD test assessments to further increase the understanding of potential AMD risk at MPO and validate the sites ongoing waste management plan.

Consistent with the previous geochemical characterisation completed at the MPO during 2020 (RGS, 2020), most samples representing overburden and interburden materials were classified as NAF material. However, there are some uncertainties in AMD classification for overburden PAF samples (KCB, 2022). This highlights the importance of the ongoing geochemical assessment to gain additional confidence to inform implementation of mine waste management systems onsite. From the 2022 Geochemical Assessment performed by KCB, ongoing site monitoring system is recommended in addition to an extended laboratory program which will provide a large data set to support the mine waste rock management approach.

The test assessment works will be continued during the next reporting period.

On 18 March 2022, MACH Energy responded to a letter from the DPIE – Water received on 29 September 2021 requesting further clarification of the MPO's management of PAF material. MACH Energy provided additional information regarding existing procedures in place for the identification and handing of PAF material and proposed monitoring and response measures.

In 2022, the following management actions were undertaken:

- Covering PAF interburden material with NAF waste material within timeframes determined by the relative reactivity of the material.
- Ensuring that PAF material is not emplaced within 10 m of the outer surface of the final landform by maintaining two separate types of waste emplacement areas (Unrestricted emplacement areas and NAF Only areas).
- Regularly reviewing the designation between the Unrestricted and NAF Only emplacement areas within the waste rock emplacement (the "PAF line").
- Periodically adjusting the "PAF line" based on the latest geomorphic landform designs to maintain a minimum of 10 m of NAF cover over Unrestricted waste disposal areas.

6 WATER MANAGEMENT

A WMP was prepared by MACH Energy in accordance with Condition 28, Schedule 3 of Development Consent DA 92/97 and approved on 31 October 2019. A review of the WMP was undertaken following the completion of the Independent Environmental Audit. The revised WMP was lodged with DPE and approved on 24 October 2022. This Annual Review reports against the currently approved WMP.

The WMP includes the following monitoring network (Figure 7):

- 14 surface water monitoring locations (W1 – W17);
- nine stream health monitoring locations (HR1 – HR6, DB, MC and SC); and
- groundwater monitoring bores covering all major hydrogeological units.

Mining activities and MOD 4 construction activities in 2022 were undertaken in accordance with the erosion and sediment control provisions of the approved WMP and CEMP.

There were two water discharge events from the MPO in 2022. The water discharge events are discussed in Section 10.2 Any future discharges of mine water will be undertaken in accordance with Development Consent DA 92/97 (Condition 26, Schedule 3), Development Consent SSD-5170 (i.e. Bengalla Mine's Development Consent) and EPL 20850.

On 17 November 2022, MACH Energy lodged an application for the variation of EPL 20850 to include a new licensed water discharge/monitoring location (point 16) for discharges in accordance with the HRSTS and to amend the premises boundary due to realignments associated with the access/fence to Bengalla Clean Water Dam Infrastructure, and the Interim Water Discharge Pipeline Arrangement. This Annual Review references the currently approved EPL 20850 (approved 28 October 2021), subject to variation approval, this will be confirmed in the next reporting period.

6.1 SURFACE WATER

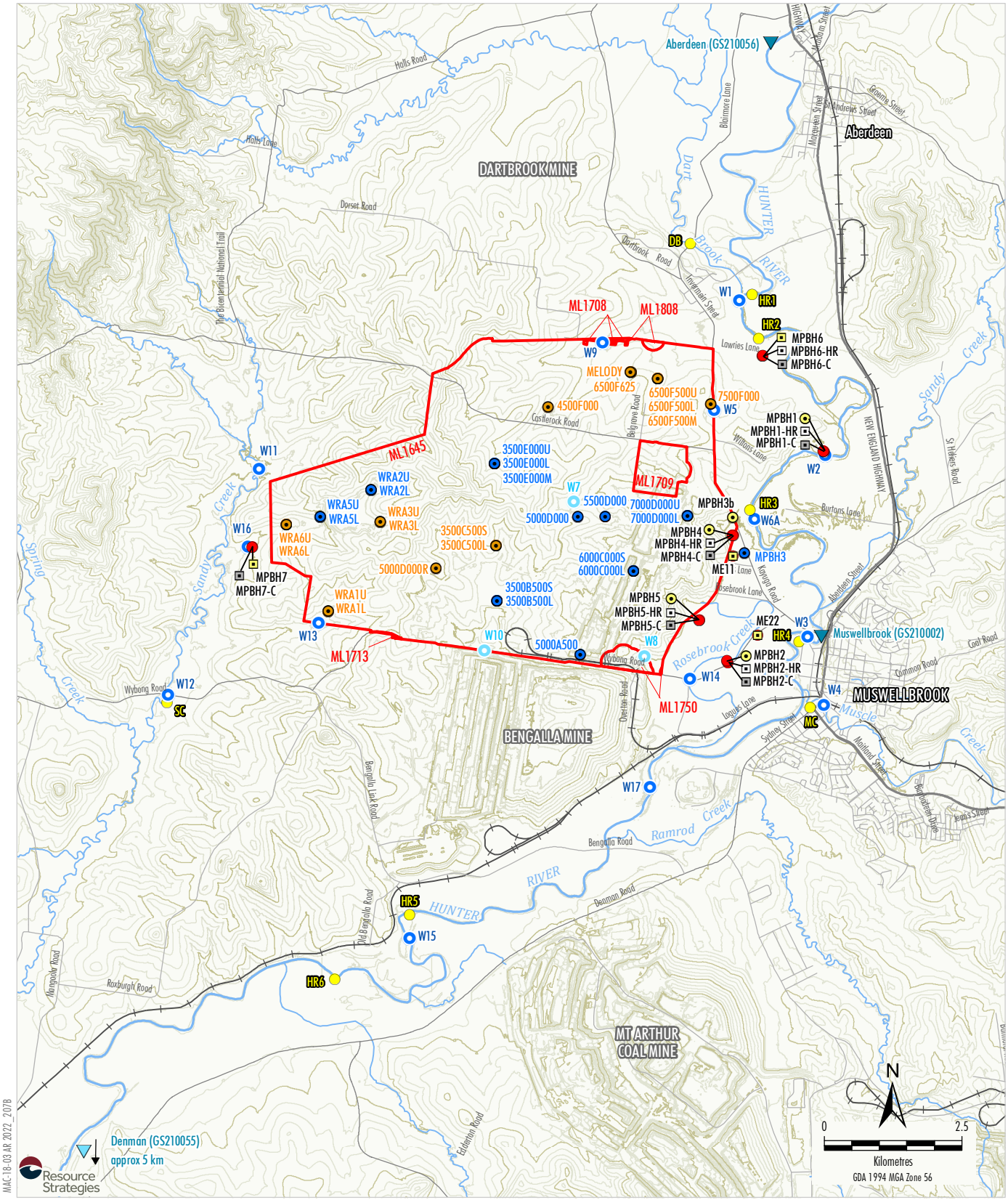
6.1.1 Approval Criteria

Surface Water Quality

Surface water monitoring is undertaken monthly and/or event based at 14 locations (Figure 7) for pH, electrical conductivity (EC), total suspended solids (TSS) and total dissolved solids (TDS), with additional monitoring conducted if triggered by a rain event. Water samples are also collected quarterly at these sites for laboratory analysis. Monitoring at sites W7 and W8 have been discontinued due to being disturbed by mining activities. Monitoring at site W10 has been discontinued as the site is located on Dry Creek directly downstream of the Bengalla Mine Dry Creek Diversion Project.

Establishment of the baseline conditions of key watercourses prior to the commencement of coal extraction was undertaken through surface water monitoring. Monitoring data has been reviewed against site-specific surface water quality triggers. The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand [ANZECC & ARMCANZ], 2000) guidelines have been superseded by the *Australian New Zealand Guidelines* (ANZG 2018). Surface water quality triggers have been developed using the ANZG (2018) / ANZECC & ARMCANZ (2000) guidelines in conjunction with baseline data collected at the site.

Trigger levels have not been established for sites upstream of the MPO (i.e. W1, W4 and W11) because these cannot be affected by the MPO. Since 2011, monitoring data has not been collected at the Hunter River site W6 due to the riverbank being too steep at this location to allow safe access. As such, water monitoring at site W6 has been discontinued and monitoring is undertaken at the new monitoring site W6A. Site W6A contains sufficient data to develop trigger levels (with the exception of TDS trigger levels). Updated trigger levels have been implemented for sites W2 and W6A as part of the WMP update. Sites W5, W9, W13 and W16 are located on ephemeral drainage lines that are frequently dry and do not have sufficient data to develop site-specific trigger levels. There was insufficient data to develop trigger levels for site W14 due to dry conditions. ANZG (2018) / ANZECC & ARMCANZ (2000) default trigger levels for these sites have been adopted, until such time as sufficient data is available to develop site-specific triggers.



Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016)

LEGEND

- Mining Lease Boundary
- Contour (10 m Intervals)
- DPI Water Gauging Station

Surface Water Monitoring

- Stream Health Monitoring Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site

Newly Established Mount Pleasant Monitoring

- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Alluvium

Mount Pleasant Monitoring

- Standpipe
- Standpipe - Alluvium
- Standpipe - Historical

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Surface Water and Groundwater Monitoring Locations

Figure 7

W17 has been assigned preliminary trigger values from the Bengalla Water Management Plan (Bengalla Mining Company [BMC], 2017). MACH Energy has established preliminary triggers at this site as it is the only site downstream of MPO's footprint on the Hunter River that is not also downstream of the Bengalla Mine footprint. MACH Energy therefore considers this site particularly important for assessing potential surface water impacts associated with the MPO (i.e. in the absence of any potential influence from Bengalla Mine).

MCO has established triggers on Sandy Creek, downstream of the MPO. A description of these triggers and how they were derived is contained in the Mangoola Coal Surface Water Monitoring Plan (MCO, 2018).

The updated site-specific trigger levels are listed in Table 21 below.

Table 21
Surface Water Quality Trigger Levels

Site	pH	EC (µS/cm)	TSS (mg/L)
	20th – 80th Percentile Trigger Levels	80th Percentile Trigger Level	80th Percentile Trigger Level
Site Specific Trigger Levels			
W2	6.5 – 8.3**	539	18
W6A*	6.5 – 8.4**	496	19
W12	6.5 – 8.1**	6420	30
W15	6.5 – 8**	460	23
Default Trigger Levels^			
W5	6.5 – 7.5	350	-
W9	6.5 – 7.5	350	-
W13	6.5 – 7.5	350	
W14	6.5 – 7.5	350	
W16	6.5 – 7.5	350	
Bengalla Mine Trigger Levels#			
W17	6.5 – 8.1	650	40

Note: µS/cm = microSiemens per centimetre and mg/L = milligrams per litre.

* Due to safe access no longer being available at site W6, triggers developed for this site will now be used at the new monitoring location W6A, approximately 500 m downstream of W6.

** Where the 20th – 80th percentile trigger values were within the default trigger levels, the default trigger levels were adopted.

^ Default trigger levels are based on the ANZG (2018) / ANZECC & ARMCANZ (2000) guideline values for upland rivers in south-east Australia. ANZG (2018) / ANZECC & ARMCANZ (2000) does not provide guideline values for TSS.

Preliminary trigger values have been sourced from the *Bengalla Water Management Plan* (BMC, 2017), which have been established from baseline data for monitoring sites adjacent to W17 (e.g. Bengalla sites W01, W02 and W03), as well as the ANZG (2018) / ANZECC & ARMCANZ (2000) guideline.

Trigger levels are not regarded as assessment criteria, rather they are used as an indicator of potential impacts and to initiate investigations into the surface water quality as reported by the monitoring program.

An investigation is triggered when both:

- a water quality indicator at a downstream receiving water monitoring location is above (or outside the range of) the trigger levels for three consecutive sampling events; and
- a water quality indicator at a downstream receiving water monitoring location is above (or below in event of a trigger of the lower pH limit) the indicator of the corresponding upstream monitoring location (where such a monitoring location exists) sampled on the same day.

The majority of sites are located on ephemeral drainage lines and therefore do not regularly experience flow for sampling.

Stream Health

Stream health monitoring continued during the reporting period at six sites outlined in the WMP located on the Hunter River (HR1, HR2, HR3, HR4, HR5 and HR6), as well as three additional sites located on Sandy Creek (SC), Dart Brook (DB) and Muscle Creek (MC) (Figure 7).

Stream health is monitored bi-annually during spring and autumn using the Australian River Assessment System (AusRivAS) aquatic invertebrate monitoring protocol. In addition to the aquatic macro invertebrate sampling, monitoring also includes: fish observations, site water quality, stream condition and presence of aquatic and riparian edge plants. Two rounds of monitoring were undertaken during the reporting period, in May 2022 (autumn) and September 2022 (spring).

Stream health trigger levels and stream health investigation protocol were revised as part of the WMP update. The updated trigger levels developed at two of the Hunter River stream health monitoring sites are outlined in Table 22.

Table 22
Stream Health Trigger Levels

Site ID	Baseline Band of Impairment Score	Trigger Level (O/E Taxa)
Hunt 571	C	0.51
Hunt 854	B	0.64

O/E = Observed/Expected.

Should a measured O/E taxa value at a particular site deteriorate below the range for its baseline band of impairment score at two successive monitoring rounds, the stream health investigation protocol (refer to the WMP) would be initiated.

6.1.2 Performance During the Reporting Period

Surface Water Monitoring

Surface water monitoring for the reporting period has been split into three groups:

- monitoring in the Hunter River (sites W1, W2, W3, W6A, W15 and W17);
- monitoring in Sandy, Muscle and Rosebrook Creeks (sites W4, W11, W12, W13, W14 and W16); and
- monitoring in other ephemeral creeks and gullies.

When there is no data available (e.g. due to prolonged dry conditions), charts are not presented in the following sub-sections.

Additional event-based monitoring was carried out in January, July, August, September, October and November, resulting in multiple monitoring records instead of one (10 January and 20 January, 5 July and 11 July, 5 August and 15 August, 16 September and 23 September, 10 October and 21 October, 1 November and 15 November, respectively).

Hunter River

Monitored pH values for the Hunter River monitoring sites during the reporting period are shown in Chart 11. Additionally, a comparison between 2017, 2018, 2019, 2020, 2021 and 2022 pH values is provided in Chart 12.

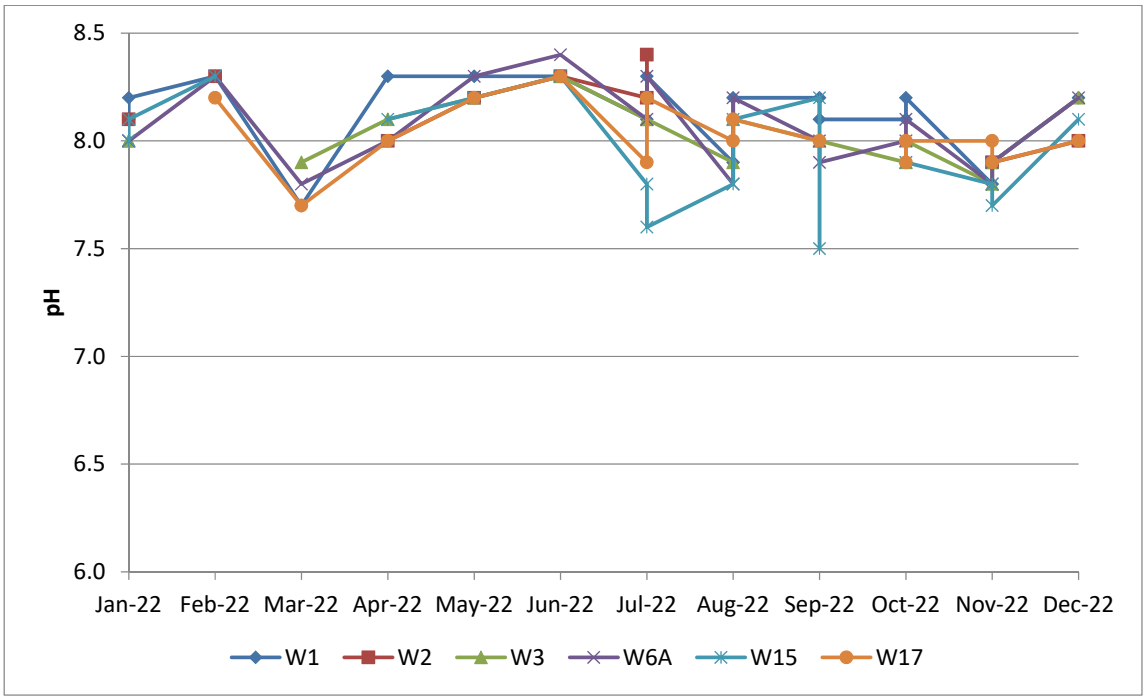

Chart 11: Hunter River pH Levels 2022

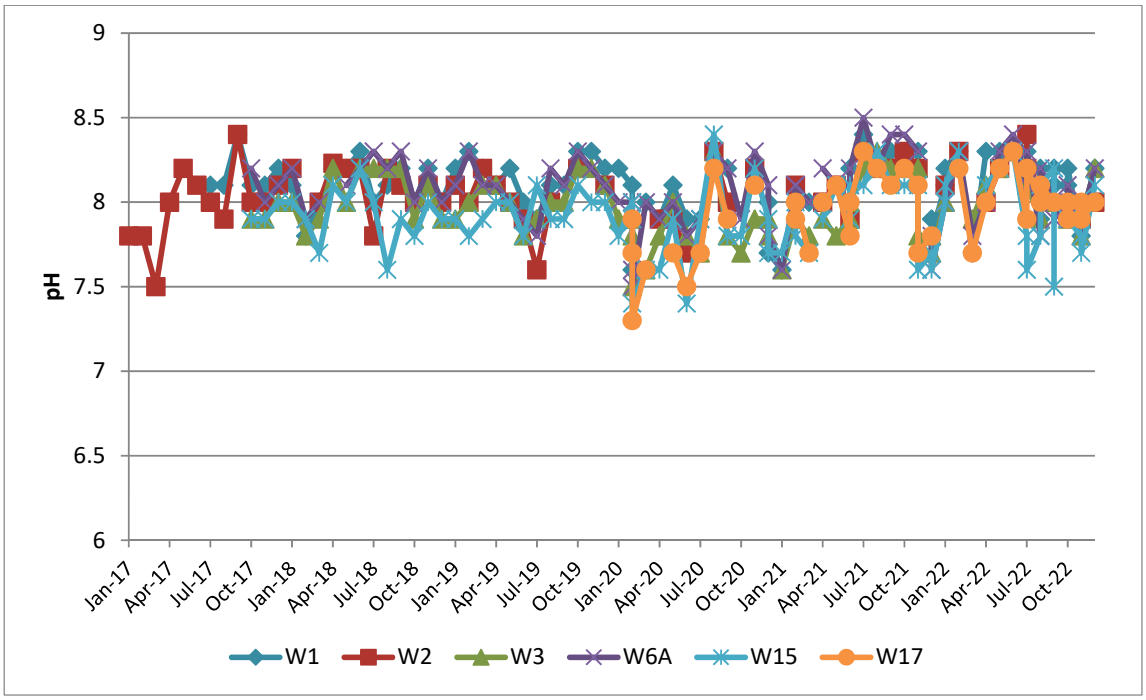

Chart 12: Hunter River pH Levels 2017 – 2022

EC values for the 2022 monitoring period are shown in Chart 13. Additionally, a comparison between 2017, 2018, 2019, 2020, 2021 and 2022 EC values is provided in Chart 14.

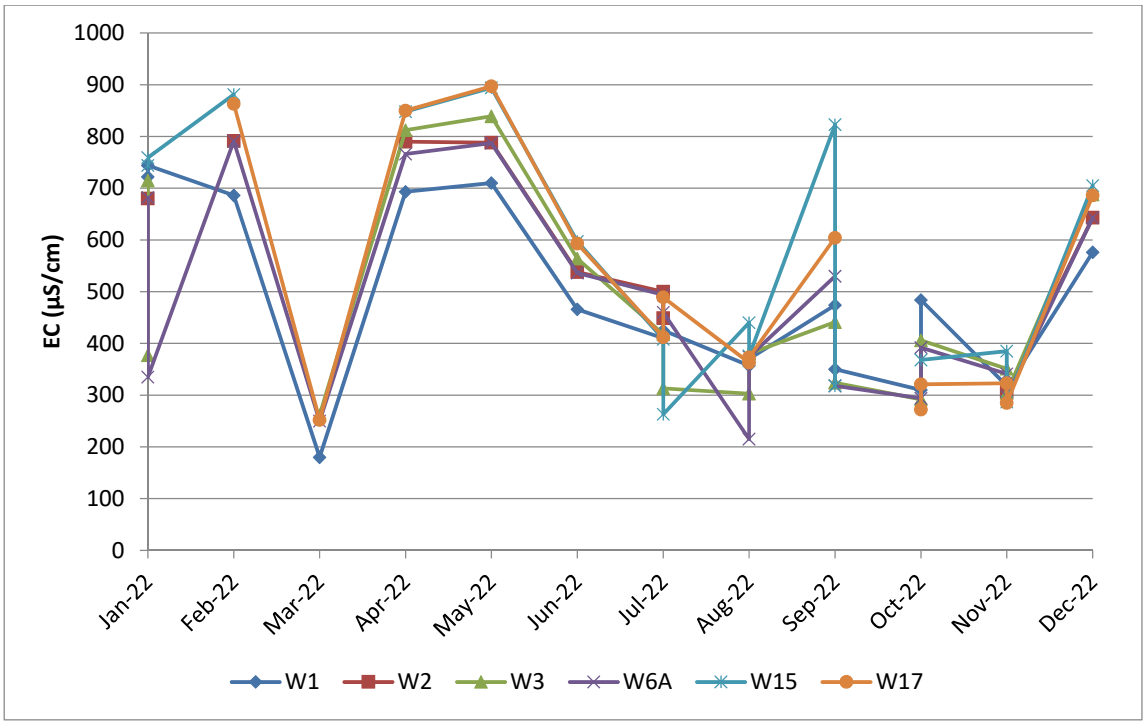

Chart 13: Hunter River EC Levels 2022

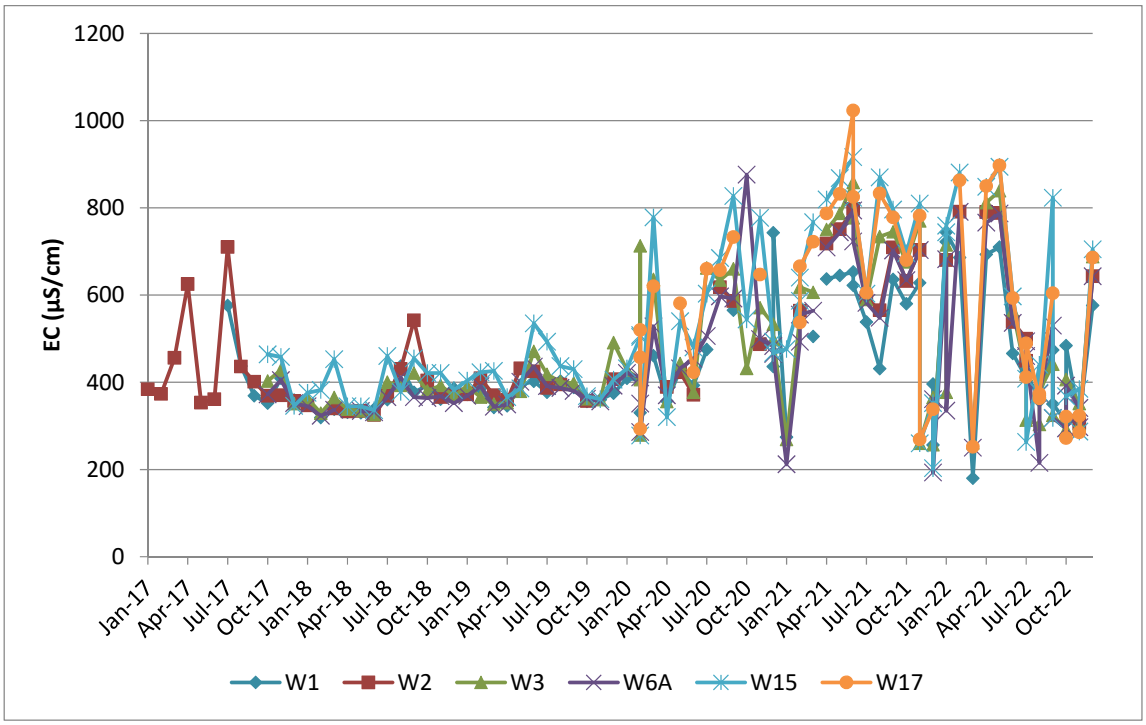

Chart 14: Hunter River EC Levels 2017 – 2022

TSS values for the 2022 monitoring period are shown in Chart 15. Additionally, a comparison between 2017, 2018, 2019, 2020, 2021 and 2022 TSS values is provided in Chart 16.

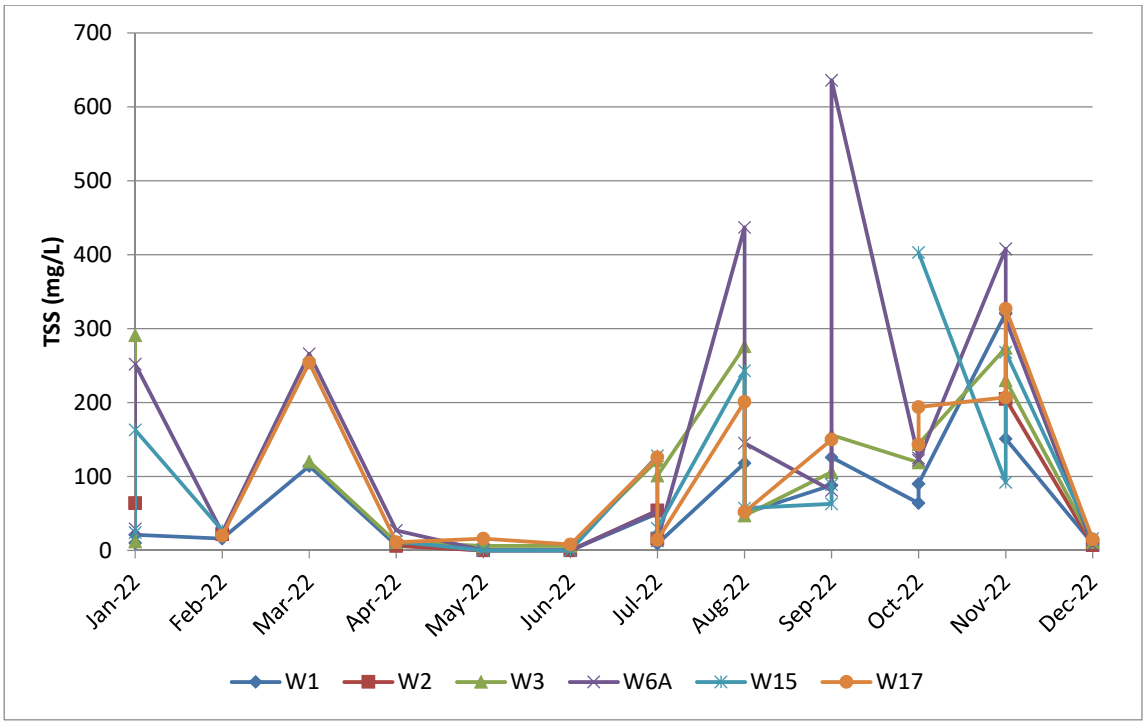

Chart 15: Hunter River TSS Levels 2022

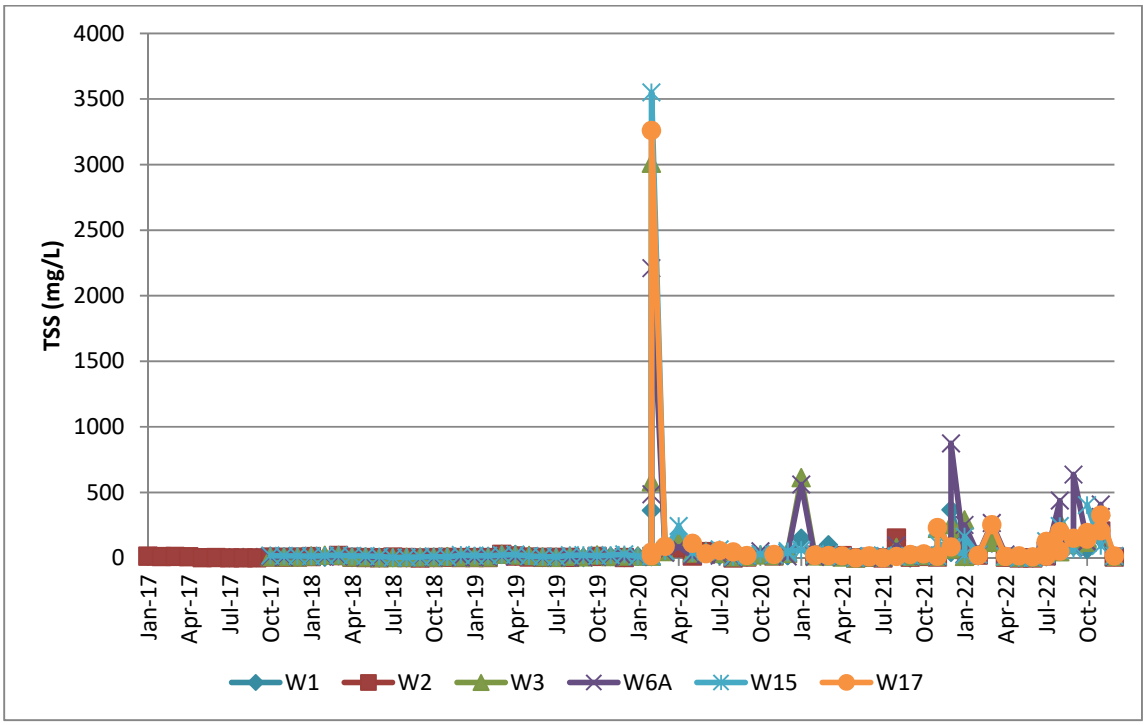

Chart 16: Hunter River TSS Levels 2017 – 2022

TDS values for the 2022 monitoring period are shown in Chart 17. Additionally, a comparison between 2017, 2018, 2019, 2020, 2021 and 2022 TDS values is provided in Chart 18.

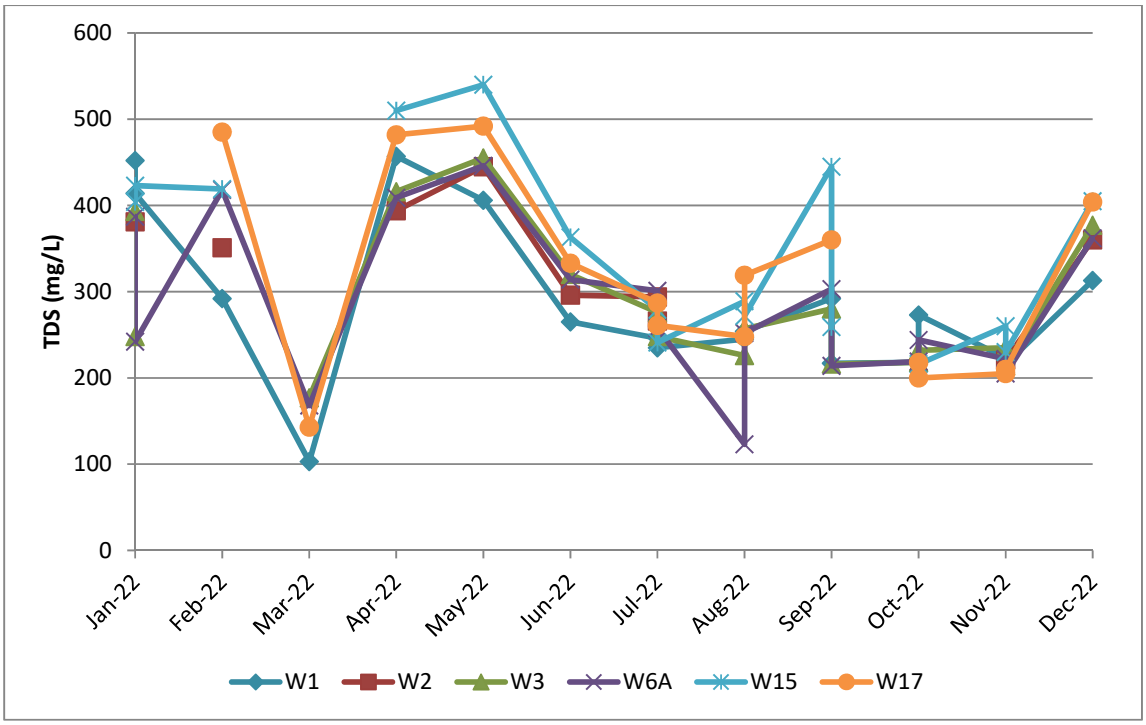

Chart 17: Hunter River TDS Levels 2022

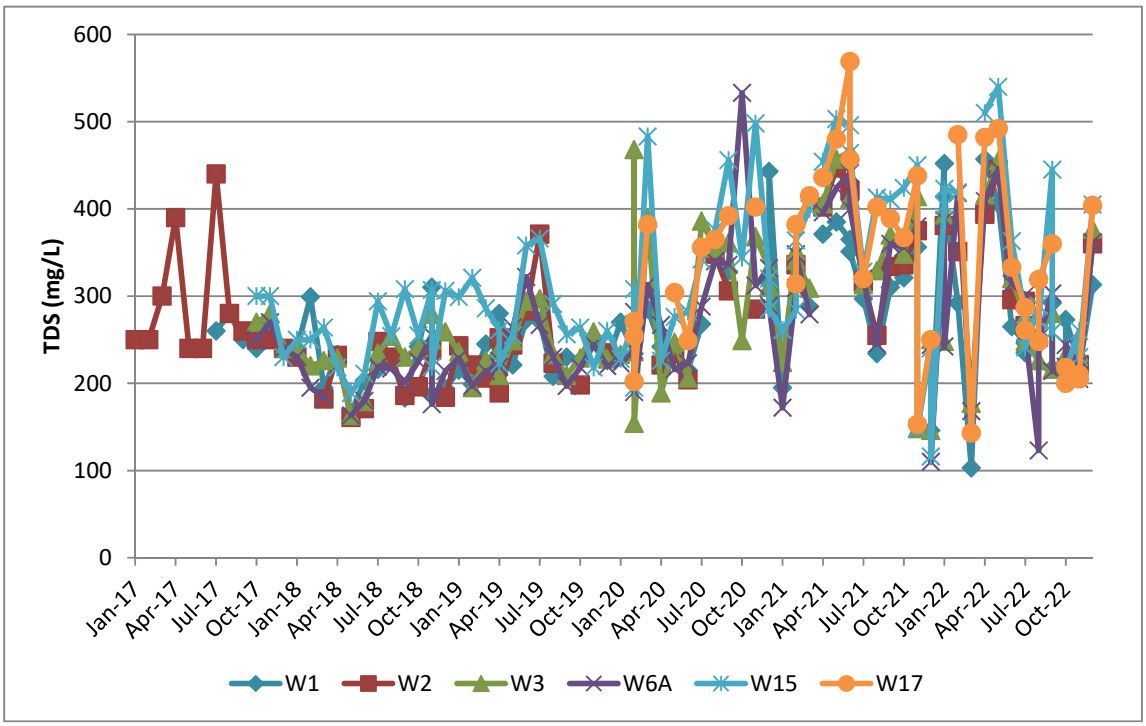

Chart 18: Hunter River TDS Levels 2017 – 2022

Sandy, Muscle and Rosebrook Creeks

Monitored pH values for the Sandy, Muscle and Rosebrook Creek monitoring sites during the reporting period are shown in Chart 19. Additionally, a comparison between 2017, 2018, 2019, 2020, 2021 and 2022 pH values is provided in Chart 20.

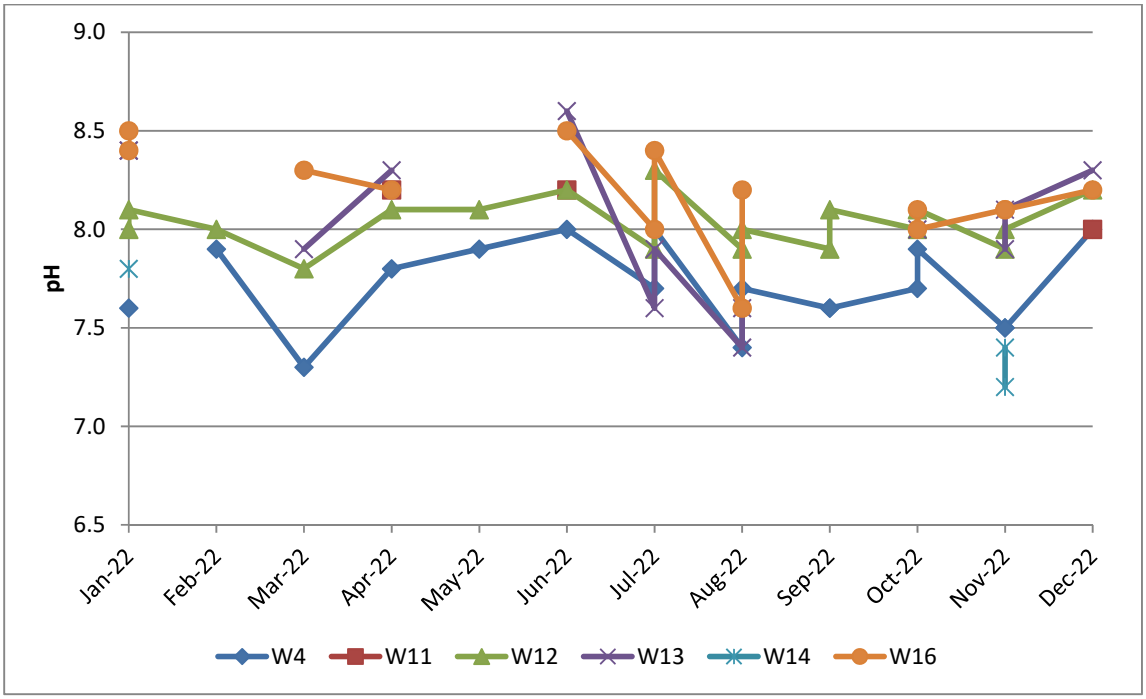

Chart 19: Sandy, Muscle and Rosebrook Creeks pH Levels 2022

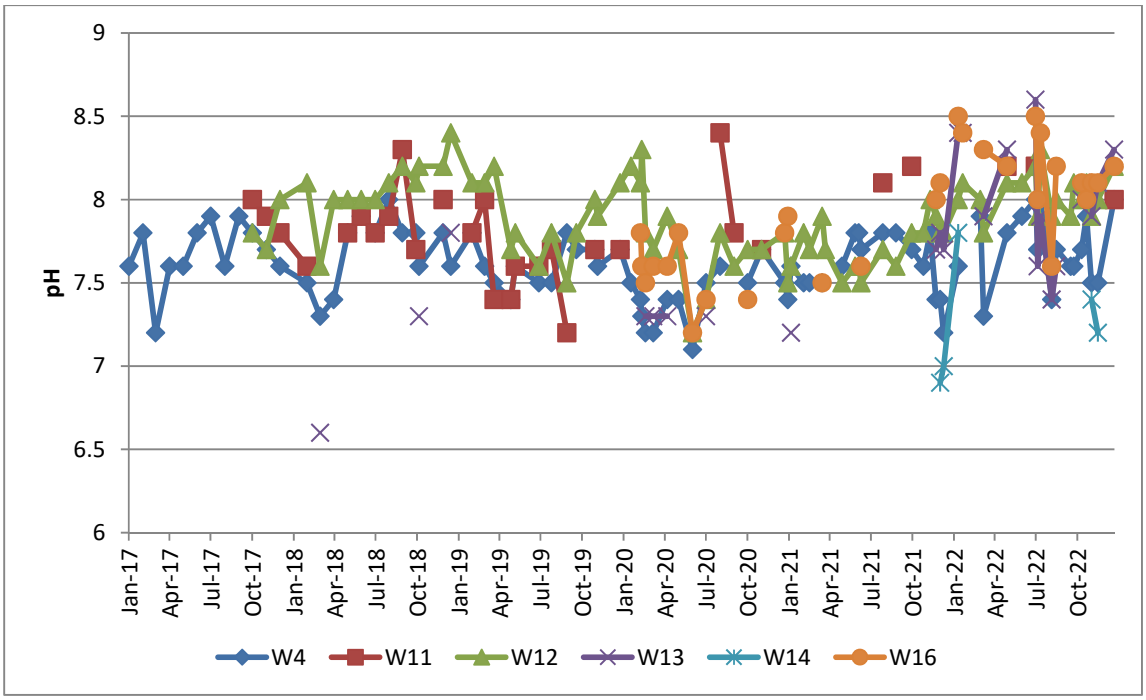

Chart 20: Sandy, Muscle and Rosebrook Creeks pH Levels 2017 – 2022

EC values for the 2022 monitoring period are shown in Chart 21. Additionally, a comparison between 2017, 2018, 2019, 2020, 2021 and 2022 EC values is provided in Chart 22.

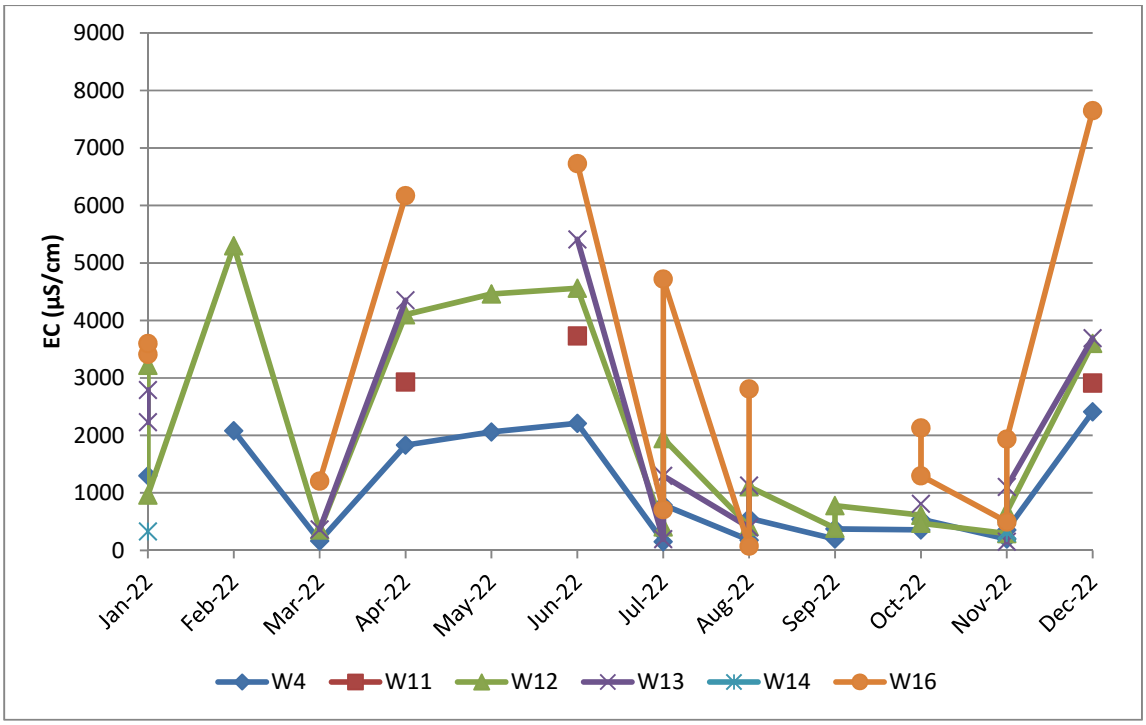

Chart 21: Sandy, Muscle and Rosebrook Creeks EC Levels 2022

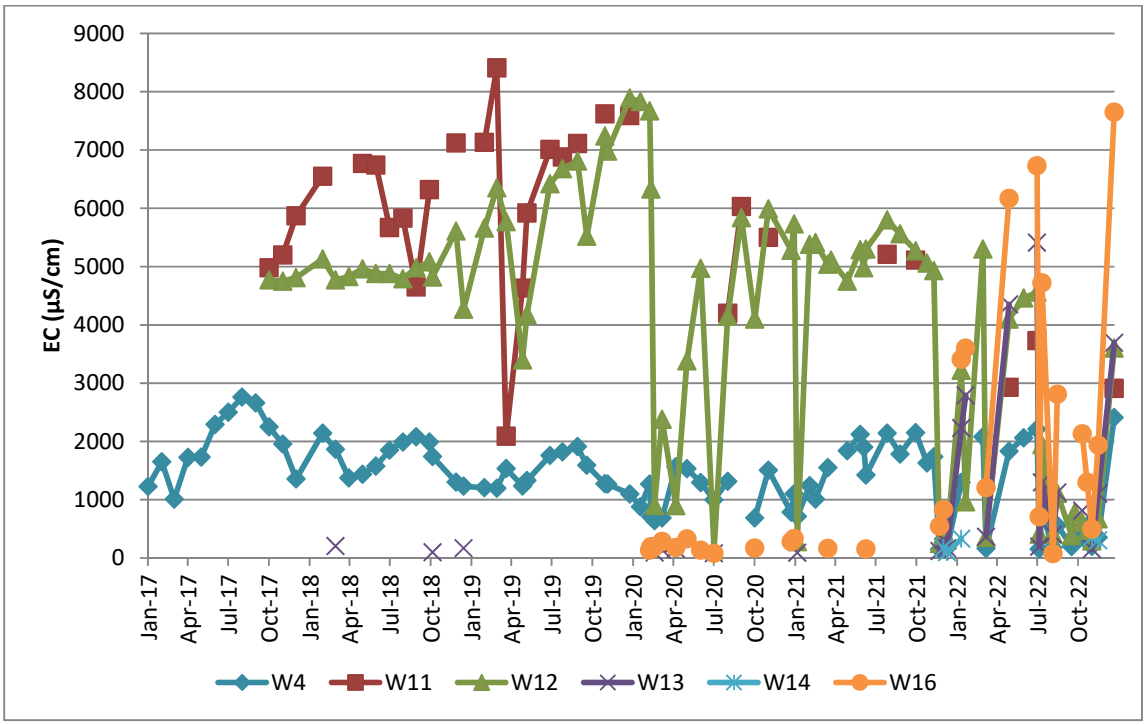

Chart 22: Sandy, Muscle and Rosebrook Creeks EC Levels 2017 – 2022

TSS values for the 2022 monitoring period are shown in Chart 23. Additionally, a comparison between 2017, 2018, 2019, 2020, 2021 and 2022 TSS values is provided in Chart 24.

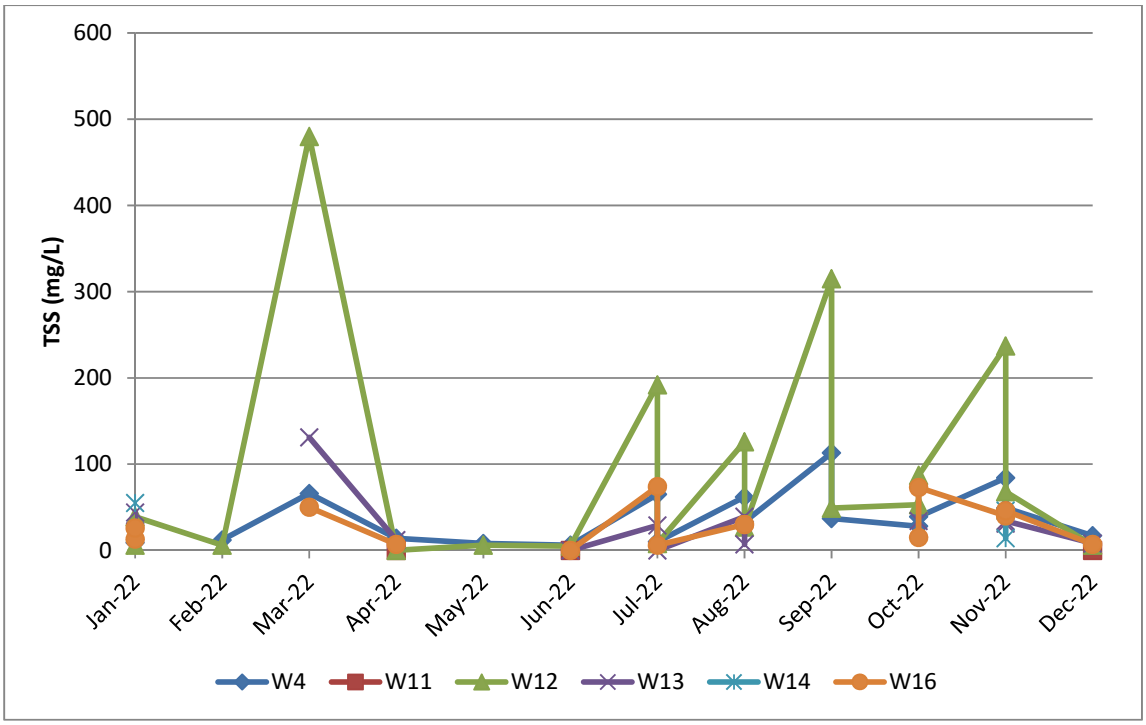

Chart 23: Sandy, Muscle and Rosebrook Creeks TSS Levels 2022

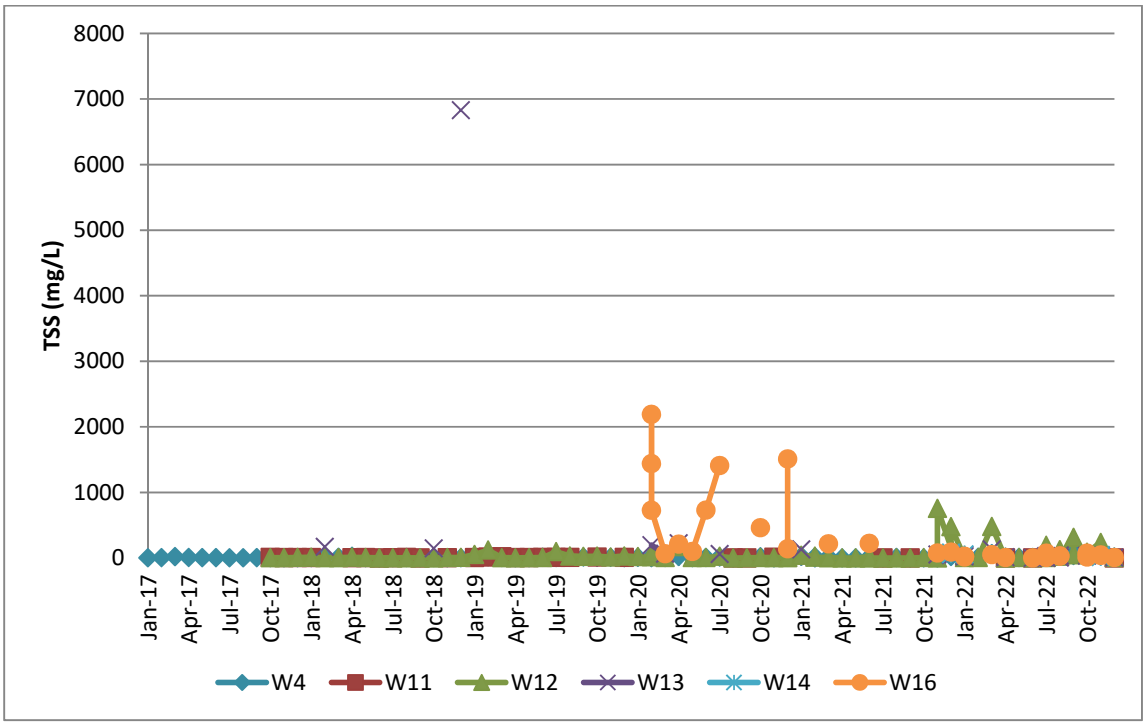

Chart 24: Sandy, Muscle and Rosebrook Creeks TSS Levels 2017 - 2022

Recorded TDS values for the 2022 monitoring period are shown in Chart 25. Additionally, a comparison between 2017, 2018, 2019, 2020, 2021 and 2022 TDS values is provided in Chart 26.

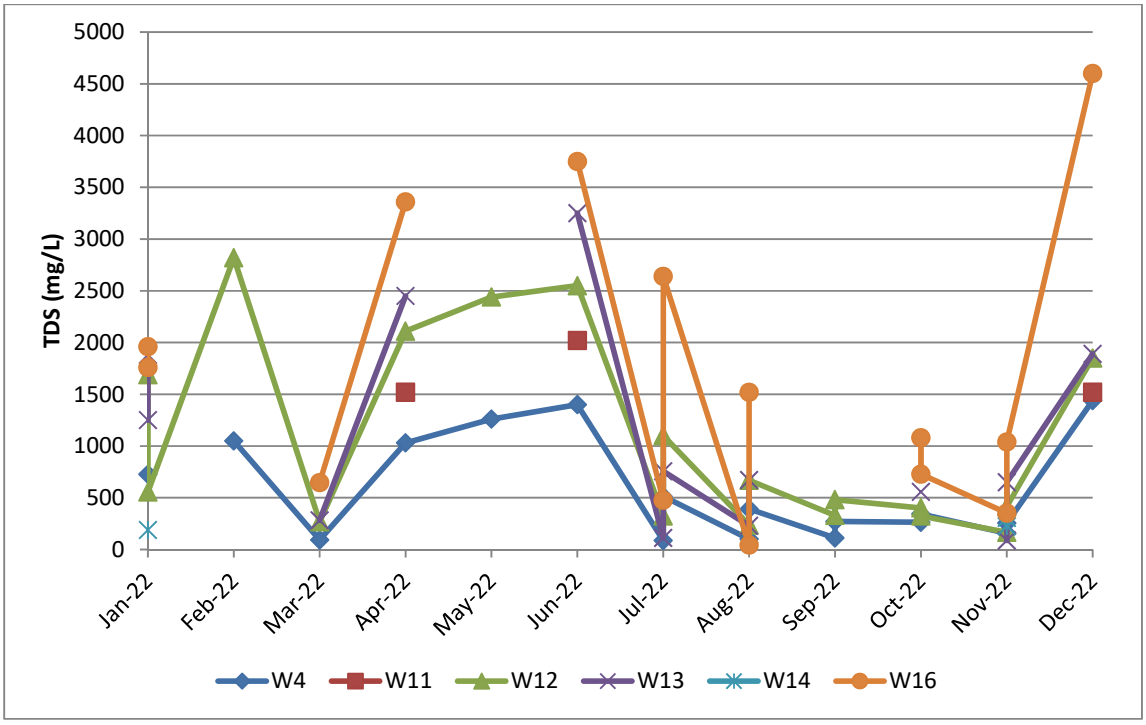

Chart 25: Sandy, Muscle and Rosebrook Creeks TDS Levels 2022

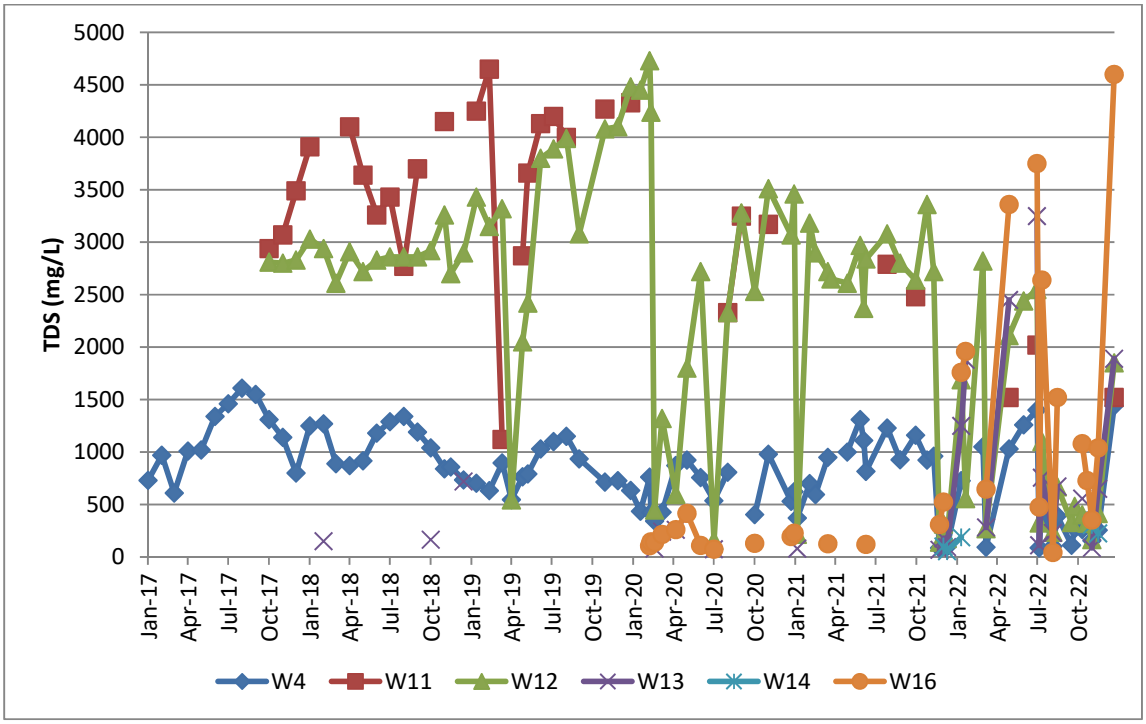

Chart 26: Sandy, Muscle and Rosebrook Creeks TDS Levels 2017–2022

6.1.3 Trends and Key Management Implications

Surface Water Monitoring

Hunter River Sites (W1, W2, W3, W6A, W15 & W17)

During the reporting period, pH levels at the Hunter River sites ranged from 7.5 to 8.4. The Hunter River sites stayed within their relevant pH investigation trigger levels, with the exception of a number of slightly higher readings at sites W15 and W17, and one higher reading at site W2 in July 2022. Monitoring site W17 recorded elevated pH readings in February, May, June and July 2022. Only site W2 has been consistently monitored for water quality since 2017. A comparison with 2017, 2018, 2019, 2020, 2021 and 2022 pH levels show that pH levels have stayed consistently between 7.3 and 8.5 to date.

Monitoring site W3 is located adjacent to DPIE – Water gauging station and is only monitored intermittently for laboratory purposes. Sites W2, W6A, W15 and W17 all recorded a number of EC readings above their relevant EC investigation trigger levels throughout the reporting period. There was a sharp decrease in EC values for sites W1, W3, W6A and W17 in March 2022. The EC values returned to values experienced from previous reporting periods, excluding December 2022 for monitoring sites W2, W6A, W15 and W17, which recorded EC levels above their relevant trigger levels. TDS values during this reporting period generally correlated with the trends recorded for EC levels at the site.

During the 2020 reporting period, the Surface Water Quality Response Protocol (SWQRP) was implemented following elevated EC trigger levels at sites W6A for three consecutive sampling rounds. MACH Energy continued monitoring of EC results, as per EPA recommendations at site W6A until June 2021 and provided the investigation findings report to DPE and EPA. The investigation findings (including a review of EC data logged by Water NSW at Muswellbrook Bridge) indicated a natural variability of water quality in the Hunter River at the Muswellbrook Bridge likely due to the impacts of low-flow, high-flow and first flush processes associated with rainfall and Glenbawn Dam releases, and this is reflected in the EC results from Site W6A. No mine water has been discharged from the MPO to date. On this basis, MACH Energy requested further fluctuations in EC levels from site W6A to be exempt from the trigger levels until the MPO undertakes licenced discharges under EPL 20850 (MACH Energy, 2022). The request was received on 21 September 2022 and the DPE and EPA did not have any comments at the time.

TSS levels for sites W2, W6A, W15 and W17 exceeded the trigger levels on a number of occasions during the reporting period. W2 had elevated TSS levels in January, February, July and November 2022. Site W6A showed elevated TSS measurements in January, February, March, April, July, August, September, October, November and December 2022. Historically, TSS values at monitoring site W6A have frequently showed elevated readings. Site W6A recorded multiple elevated TSS readings, this was likely due to variations in flow due to rainfall runoff. Due to this, large variations in readings were expected and the SWQRP was not implemented.

TSS levels for site W17 recorded elevated measurements in March, July, August, September, October and November 2022. The TSS results may have been influenced by external factors such as heavier rainfall than other sites received, and topography of the area which allows additional runoff from surrounding farmland (AECOM, 2020) after an extended period of drought conditions. Flooding occurred throughout the year at site W17, variations in TSS levels are likely due to flood flows and rainfall runoff. Due to this, large variations in readings were expected and the SWQRP was not implemented.

TDS levels for all Hunter River sites generally fluctuated between approximately 103 mg/L and 540 mg/L.

Sandy, Muscle and Rosebrook Creek Sites (W4, W11, W12, W13, W14 & W16)

Monitored pH values during the reporting period at the Sandy, Muscle and Rosebrook Creek sites ranged from 7.2 to 8.6. Monitoring sites W4 and W11 remained generally consistent during the reporting period. Monitoring sites W13, W14 and W16 all had a number of elevated recordings above their relevant pH trigger levels. Monitoring site W12 had elevated pH readings in June, July and December 2022. Only site W4 has been consistently measured for water quality since 2017. Monitoring since 2017 shows generally consistent values of pH for site W4.

EC monitoring results at sites W4, W11, W12, W13 and W14 remained generally consistent during the reporting period. Monitoring sites W4, W11 and W12 remained below their relevant EC trigger levels during the reporting period. Monitoring sites W13 and W16 had a number of elevated EC recording during the reporting period. Monitoring sites W11 and W14 were not accessible for most of the reporting period due to wet conditions, resulting in a limited number of samples collected. The monitored EC levels for the sites were generally consistent with, or lower than, the levels recorded between 2017 – 2021. EC results may have been influenced by external factors such as heavier rainfall after an extended period of drought conditions.

TSS values were generally consistent in sites W4, W11, W13, W14 and W16 during the reporting period. W12 showed elevated TSS readings in January, March, July, August, September, October and December. TSS results may have been influenced by external factors such as heavier rainfall after an extended period of drought conditions.

TDS values generally stayed consistent throughout the reporting period at the Sandy, Muscle and Rosebrook Creek sites, and generally correlated with the trend recorded for EC levels at the sites.

The 2017 – 2022 trends for pH and TSS for site W4 were generally consistent with observations made in the EIS (ERM Mitchell McCotter, 1997). EC and TDS levels at site W4 have increased since recordings made in the EIS. This site is located on Muscle Creek within Muswellbrook, upstream of the MPO and therefore any increase is not associated with MPO activities. This site has naturally occurring salts in surrounding soils and rocks, and data from previous annual reviews indicates that large fluctuations at this site are not unusual (Coal & Allied, 2016; MACH Energy, 2017b; MACH Energy, 2018; MACH Energy, 2019; MACH Energy, 2020; MACH Energy, 2021; MACH Energy 2022).

Stream Health Monitoring

The Autumn 2022 Stream Health Monitoring Report was prepared following the May 2022 monitoring round. The key findings of the report were as follows:

- Sites within Dart Brook, Muscle Creek and Sandy Creek indicate these catchments have been degraded by historical land use. Water quality data, particularly elevated salinity and low dissolved oxygen, reflects the condition of their catchments.
- Flow was recorded within Hunter River, Muscle Creek, Sandy Creek and Dart Brook. For the first time since sampling begun, Sandy Creek had flow, connecting the isolated pools. High flows were recorded at Dart Brook where fallen trees and woody debris were present.
- Results from the AusRivAS analyses indicate that macroinvertebrate assemblages at all of the sites sampled were dominated by pollution-tolerant taxa.
- No aquatic species of conservation significance were recorded at the monitoring sites.
- Species composition of fish sampled in Autumn 2021 was comparable with that observed in previous surveys.
- Measurements taken up to the present survey (Autumn 2021) have not detected any statistically significantly changes that could be indicative of an impact associated with the MPO.

The Spring 2022 Stream Health Monitoring Report was prepared following the September 2022 monitoring round. The findings of the report were as follows:

- Sites within Dart Brook, Muscle Creek and Sandy Creek indicate these catchments have been degraded by historical land use. Water quality data, particularly elevated salinity and low dissolved oxygen, reflects the condition of their catchments.
- Heavy rainfall within the catchment preceding the Spring survey caused moderate flows. Hunter River, Dart Brook, Muscle Creek and Sandy Creek overflowed their banks due to flooding. Flood flows further degraded sections of the banks.
- No aquatic species of conservation significance were recorded at the monitoring sites.
- Results from the AusRivAS analyses indicate that macroinvertebrate assemblages at all of the sites sampled were largely dominated by pollution-tolerant taxa.
- Band levels remained steady between the Autumn and Spring 2022 surveys.
- Overall, examination results from the 2021 Spring survey did not detect any measurable change that could indicate an impact associated with the MPO.

The stream health trigger levels established within the WMP were exceeded on each sampling occasion since 2017. These consecutive exceedances trigger the stream health investigation protocol in accordance with the Surface and Groundwater Response Protocol (SGWRP). However, as previously stated in the Spring and Autumn 2021 Stream Health Monitoring Reports prepared by Bio-Analysis Pty Ltd, the investigation is not considered warranted as:

- the trigger levels developed within the SWMP are based on historical data presented in Hose and Turak (2004), which were collected on one sampling occasion at the sites;
- the MPO has been a nil discharge site in accordance with EPL 20850 throughout the monitoring period;
- external influences including rural and urban run-off and flow regulations are likely to have impacted aquatic biota within the monitoring sites since the baseline survey was carried out; and
- seasonal variation of the structure of assemblages of macroinvertebrates occurred (Stark and Phillips, 2009).

MACH Energy will continue to monitor stream health during autumn and spring in future monitoring periods. Revised stream health trigger levels and the stream health investigation protocol were revised as part of the WMP update and approved on 24 October 2022 (Section 2.1). This Annual Review reports against the new trigger levels and updated stream health investigation protocol.

6.2 GROUNDWATER

6.2.1 Approval Criteria and Management Plan Requirements

Groundwater monitoring is undertaken at a network of bores which are broadly distributed across the MPO area (Figure 7) and which cover all major hydrogeological units.

Groundwater monitoring includes:

- manually monitoring of water levels on a quarterly basis;
- quarterly sampling of pH and EC;
- annual sampling of a suite of laboratory parameters; and
- regular groundwater inflows as recorded from flow meters or recording of pumping times and rates.

Groundwater trigger levels have been developed for the MPO, based on the NSW Aquifer Interference Policy and the ANZG (2018) / ANZECC & ARMCANZ (2000) guidelines. These trigger levels include standing water level (SWL) triggers for the eastern groundwater sites, and EC and pH for all sites, as presented in the WMP and in Tables 23 and 24.

Beneficial use categories have been assigned to each monitoring bore based on its 80th percentile baseline EC and the EC ranges specified in the WMP. Should a measured EC value exceed the beneficial use quality range EC for a particular bore at three successive monitoring rounds (as defined in the WMP), the groundwater investigation protocol, as detailed in the SGWRP, would be initiated.

Following the trigger of the Groundwater Quality Response Protocol in 2018, EC trigger levels for 6500F500 M&L, 4500F500 and 5500D000 and pH trigger levels for all groundwater monitoring sites were updated in 2019. With the most recent WMP update on 24 October 2022, there have been no changes to the pH and EC trigger levels.

Bore 5000D000-R was implemented into the groundwater monitoring network in April of this reporting period. Triggers for the bore are being developed with sampling undertaken in August and November of this reporting period. Further sampling in the next reporting period is required before trigger levels are established.

Table 23
Groundwater Triggers – Water Level

Bore	Screened Interval (mbgl)	Observed Groundwater Level (mbgl)		Trigger Level (mbgl)
		Minimum	80th percentile	
MPBH1	12.6 – 18.6	8.8	9.7	11.7
MPBH2	11.5 – 17.5	11.6	12.2	14.2
MPBH3b	Well to 14 m	11.6	12.0	Dry (or 14.0 m)

Note: mbgl = metres below ground level.

Table 24
Groundwater Triggers – Water Quality

Site	pH		pH Trigger Range	EC		
	20th %ile	80th %ile		80th %ile (µS/cm)	Beneficial Use Category	Trigger (µS/cm)
3500B500U	7.2	9.6*	6 – 8.5	3,530	Irrigation	7,800
3500B500L	7.1	7.4		5,826	Irrigation	7,800
3500C500U	7.1	7.4		5,664	Irrigation	7,800
3500C500L	7.2	7.4		5,590	Irrigation	7,800
4500F000	6.5	6.9		6,904	Saline	22,000
5000D000	6.7	7.0		703	Potable	800
5000D000-R^	-	-		-	-	-
5500D000	6.4	6.9		1,570	Irrigation	7,800
6000C000U	6.4	7.1		4,984	Irrigation	7,800
6000C000L	7.0	7.2		5,474	Irrigation	7,800
6500F500U	6.8	7.0		5,778	Irrigation	7,800
6500F500M	6.9	7.2		2,804	Irrigation	7,800
6500F500L	6.5	7.0		1,526	Irrigation	7,800
6500F625	6.7	7.0		4,086	Irrigation	7,800
7000D000U	6.6	7.6		6,730	Irrigation	7,800
7000D000L	6.6	6.8		1,370	Marginal Potable	2,350
7500F000	6.7	7.6		5,918	Irrigation	7,800
WRA1U	-	-		-	-	-
WRA1L	7.2	7.7		4,496	Irrigation	7,800
WRA2U	6.7	7.0		4,108	Irrigation	7,800
WRA2L	7.0	7.3		6,086	Irrigation	7,800
WRA3U	7.1	7.5		9,020	Saline	22,000
WRA3L	6.6	6.9		16,734	Saline	22,000
WRA5U	7.1	7.4		4,772	Irrigation	7,800
WRA5L	7.1	7.8		7,034	Irrigation	7,800
WRA6U	6.8	7.0		11,240	Saline	22,000
WRA6L	7.2	7.7		5,970	Irrigation	7,800
MPBH1	6.8	7.1		590	Potable	800
MPBH2	6.8	7.1		930	Marginal Potable	930**
MPBH3	6.6	6.9		1,083	Marginal Potable	1,083**
MPBH3b	7.4	7.7		4,420	Irrigation	7,800
MPBH4 (formerly A1)^	-	-		-	-	-
MPBH5 (formerly B1)^	-	-		-	-	-
Melody Bore^	-	-		-	-	-

Notes:

* pH values for bore 3500B500S exceed the pH trigger range of 6 – 8.5 however, this bore was mined through in August 2018.

** Existing 80th percentile values have been adopted for these bores given the baseline water quality is close to potable and these sites are representative of the Hunter River alluvium.

^ Sufficient data is not yet available to develop baseline trigger ranges for new bores 5000D000-R, MPBH4 and MPBH5, or Melody Bore. This table will be revised with the appropriate values once the data becomes available. For more information on these bores refer to the WMP.

The pH trigger levels were updated to apply a single trigger range of 6 – 8.5. This decision was made as the proposed 20th to 80th percentile trigger ranges proved to be too narrow and resulted in exceedances of the triggers under neutral pH conditions. The adopted range of 6 – 8.5 pH units is consistent with the pH recommended by ANZG (2018) / ANZECC & ARMCANZ (2000) to prevent corrosion of infrastructure associated with the groundwater, as well as the recommend range for drinking water as outlined in the Australian Drinking Water Quality Guidelines (National Health and Medical Research Council [NHMRC] & National Resource Management Ministerial Council [NRMMC], 2011).

At any bore where a monitored pH value is outside the applicable baseline range at three successive monitoring rounds, the groundwater investigation protocol would be initiated.

6.2.2 Performance During the Reporting Period

Monitoring bores are split into three categories:

- Groundwater Central Bores: representative of the hard rock aquifer (3500B500L&S, 3500C500L&S, 4500F000, 5500D000, 5000D000 and 5000D000-R, 6000C000L&S, 6500F500L,M&U, 7000D000L&U, 7500F000, 6500F625 and Melody).
- Groundwater Eastern Bores: representative of the alluvial aquifer (MPBH1, MPBH1-C&HR, MPBH2, MPBH2-C&HR, MPBH3b, MPBH4, MPBH4-C&HR, MPBH5, MPBH5-C&HR, MPBH6 and MPBH6-C&HR).
- Groundwater Western Bores: representative of the hard rock aquifer in, or in the vicinity of, the Fine Rejects Dam (WRA1L&U, WRA2L&U, WRA3L&U, WRA5L&U, WRA6L&U, MPBH7 and MPBH7-C).

Bores 3500B500L&S, 6000C000L&S, 7000D000L&U, WRA2L&U and WRA5L&U were decommissioned prior to the previous reporting period. Notwithstanding, the data collected from these bores during previous years has been included to assist with trend analysis. Bores WRA3L&U were decommissioned during the previous reporting period (November), however the data collected from these bores have also been included to assist in trend analysis.

Two new monitoring bores will be installed to replace bores WRA3L&U. Thew new monitoring bores and updated groundwater monitoring program will be included in the next update of the WMP.

It was previously proposed to include two additional sites to the east of the MPO identified during the bore census (i.e. ME11 and ME22). This is no longer considered to be necessary due to the installation of nested standpipes (sampling the alluvium, interburden and coal seam) at the nearby sites MPBH4, MPBH5 and MPBH2.

The results of monitoring SWL (measured in mbgl), EC and pH from 2015 to 2022 for the groundwater central bores are shown in Charts 27, 28 and 29 respectively.

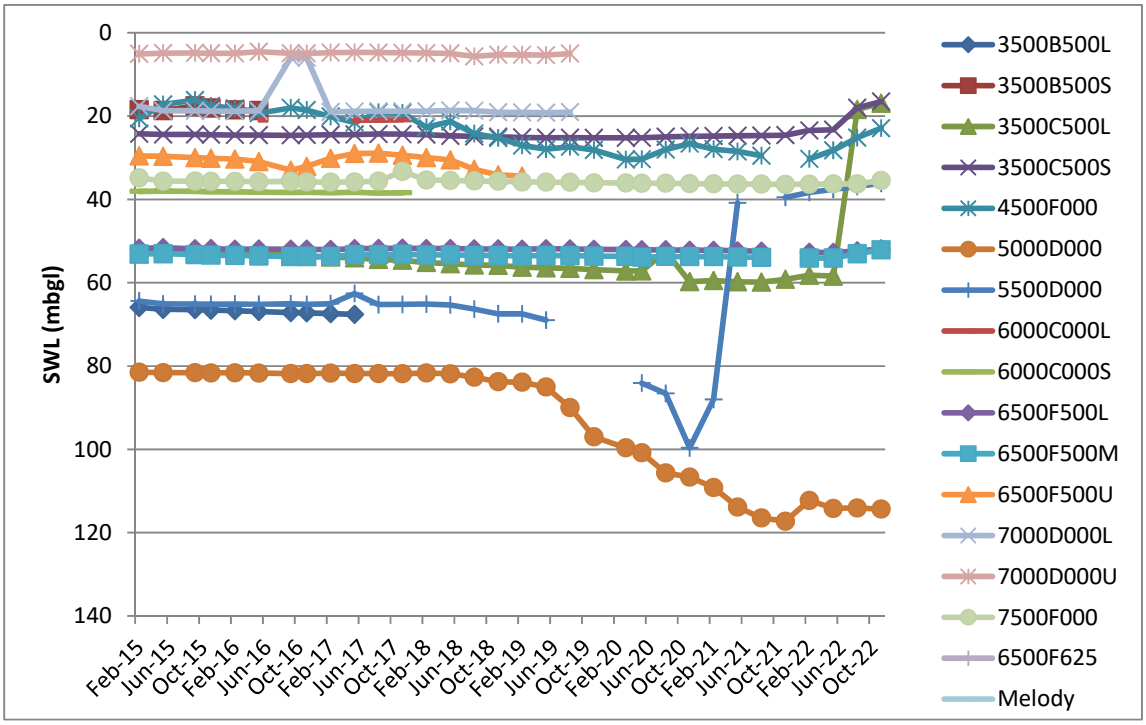

Chart 27: Groundwater Central Bores SWL 2015 – 2022

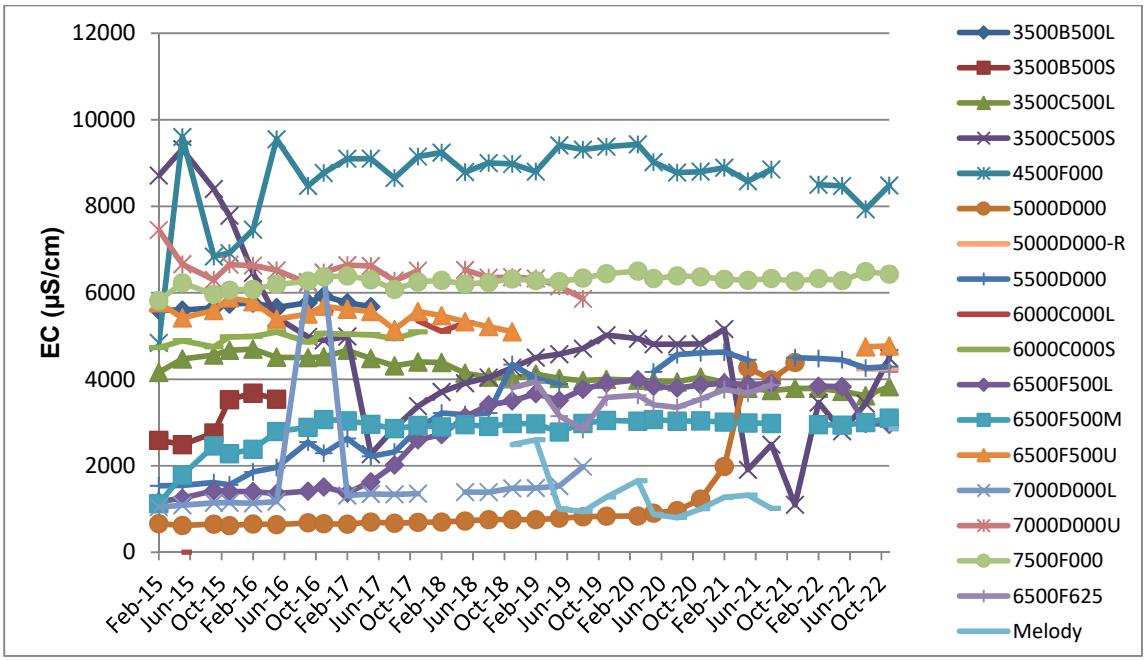

Chart 28: Groundwater Central Bores EC 2015 – 2022

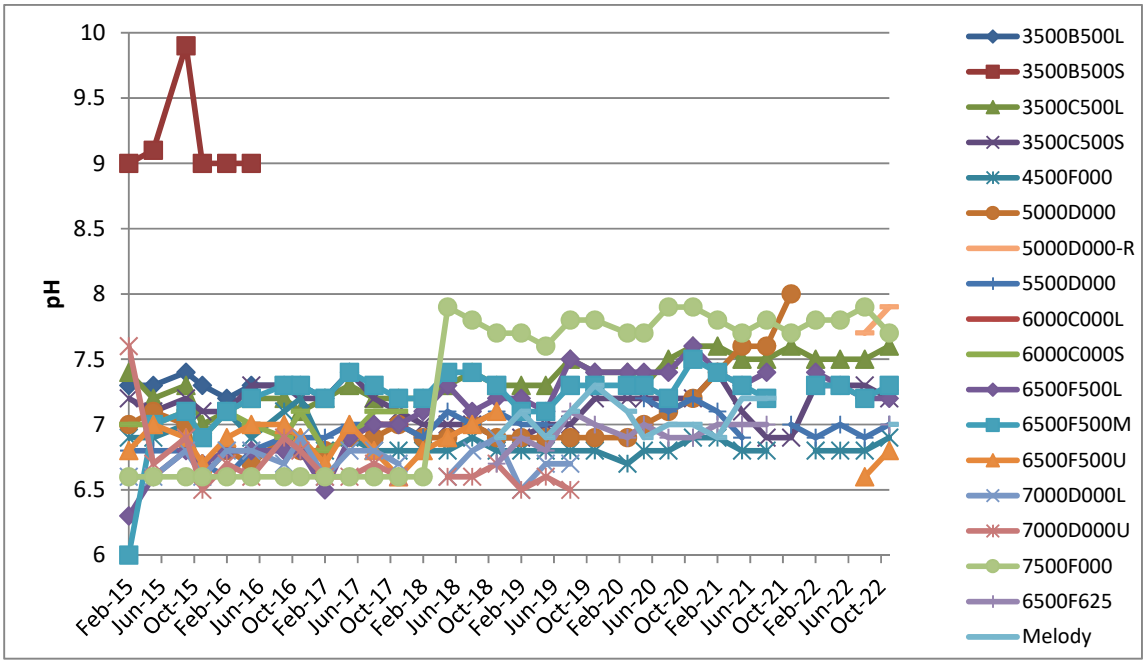

Chart 29: Groundwater Central Bores pH 2015 – 2022

The results of monitoring SWL, EC and pH from 2015 to 2022 for the groundwater eastern bores are shown in Charts 30, 31 and 32 respectively.

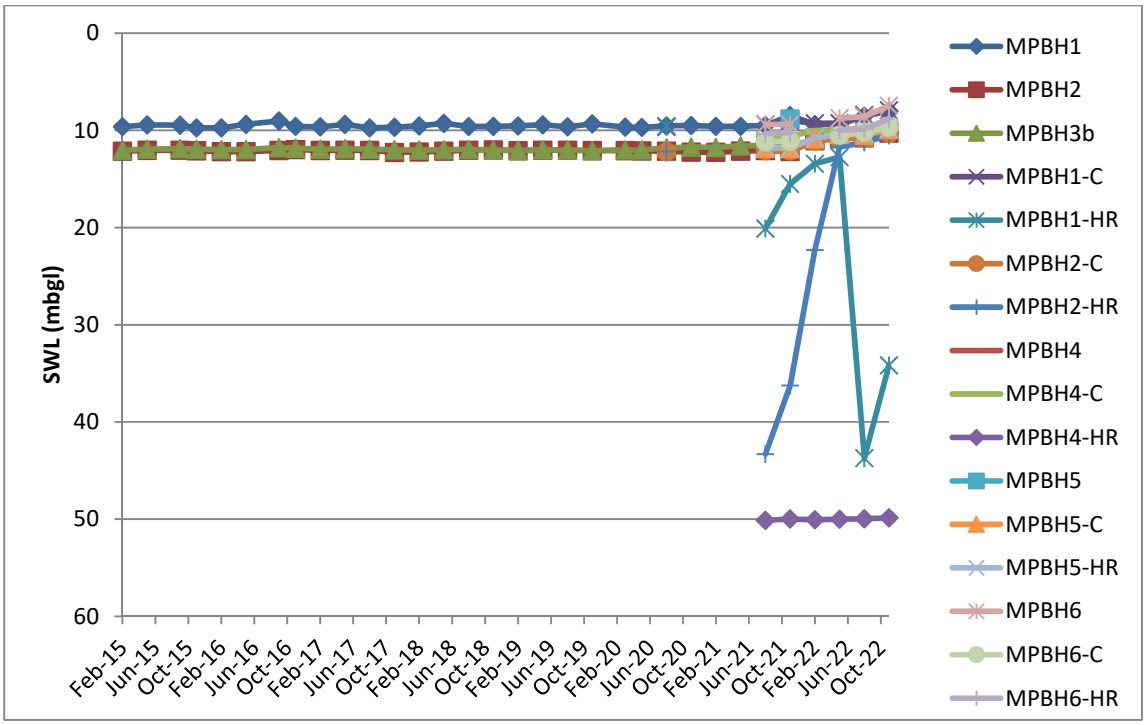

Chart 30: Groundwater Eastern Bores SWL 2015 – 2022

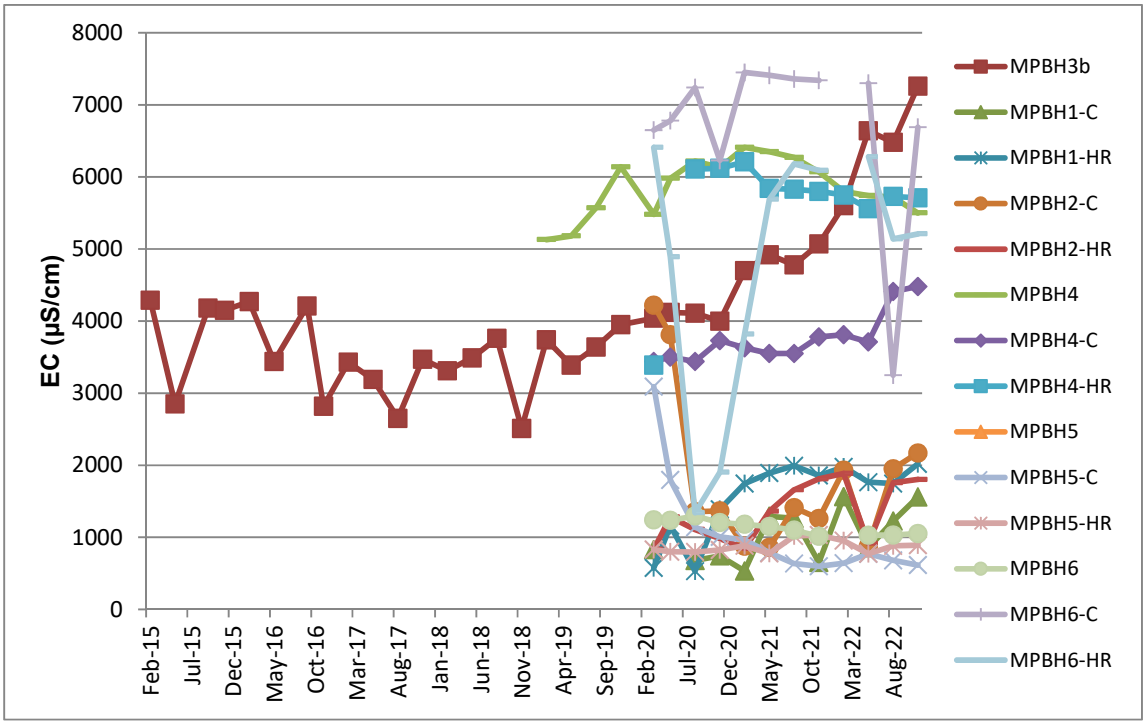

Chart 31: Groundwater Eastern Bores EC 2015 – 2022

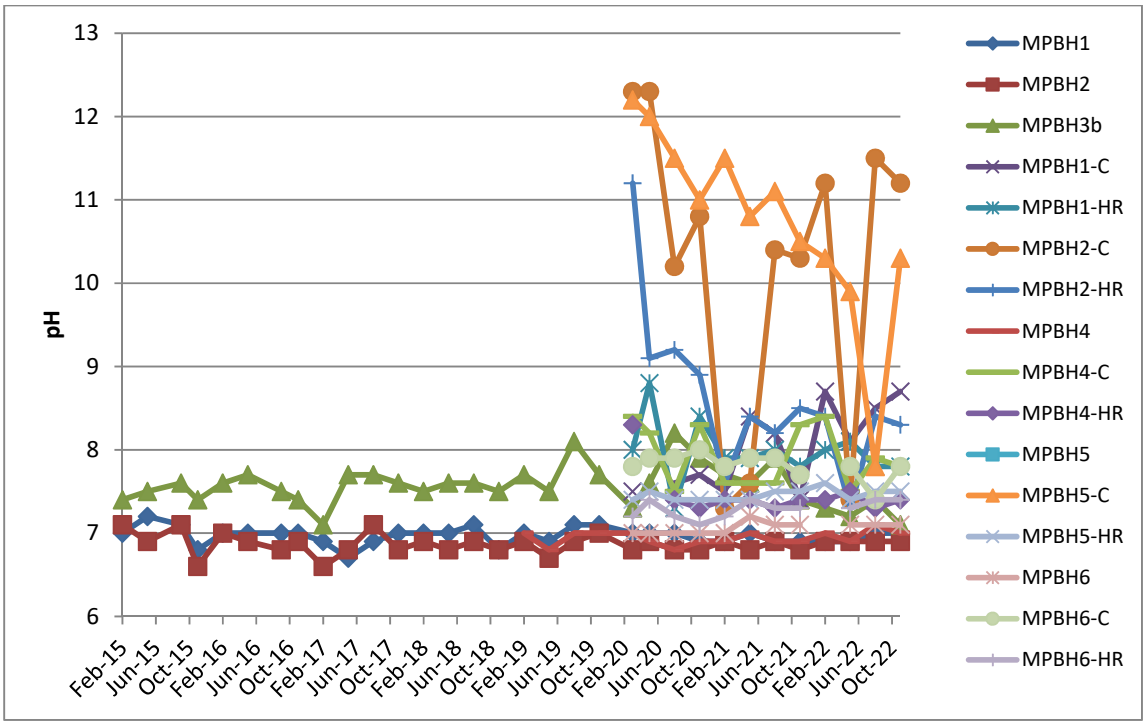

Chart 32: Groundwater Eastern Bores pH 2015 – 2022

The results of monitoring SWL, EC and pH from 2015 to 2022 for the groundwater western bores are shown in Charts 33, 34 and 35 respectively.

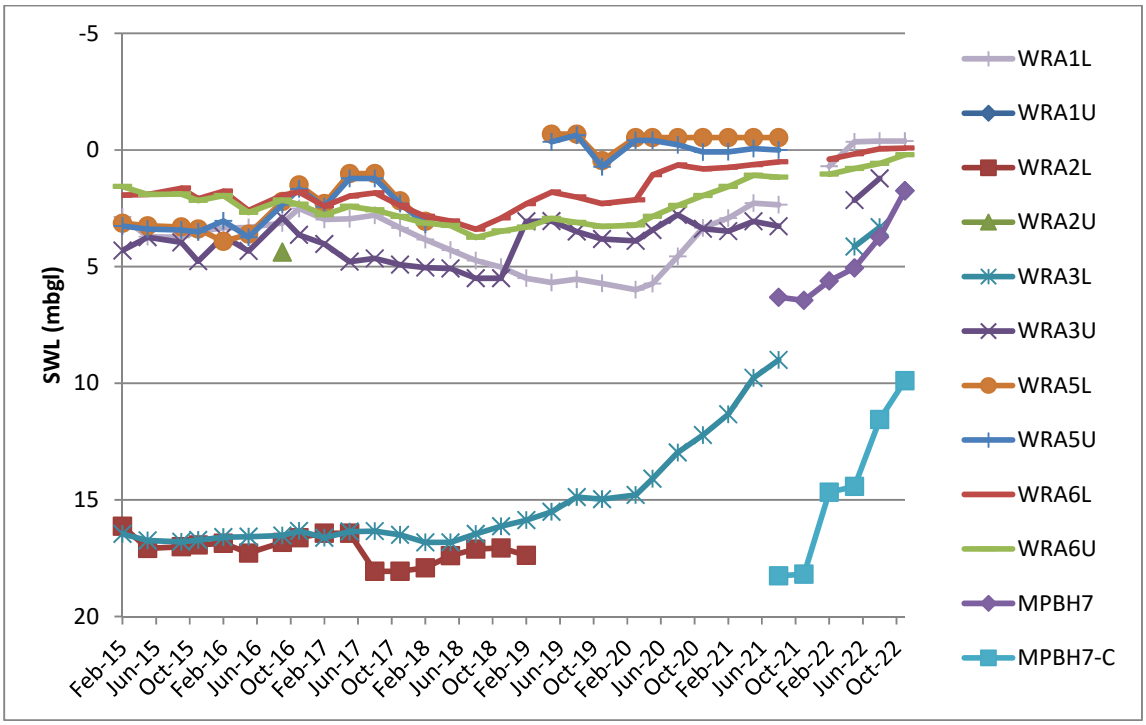

Chart 33: Groundwater Western Bores SWL 2015 – 2022

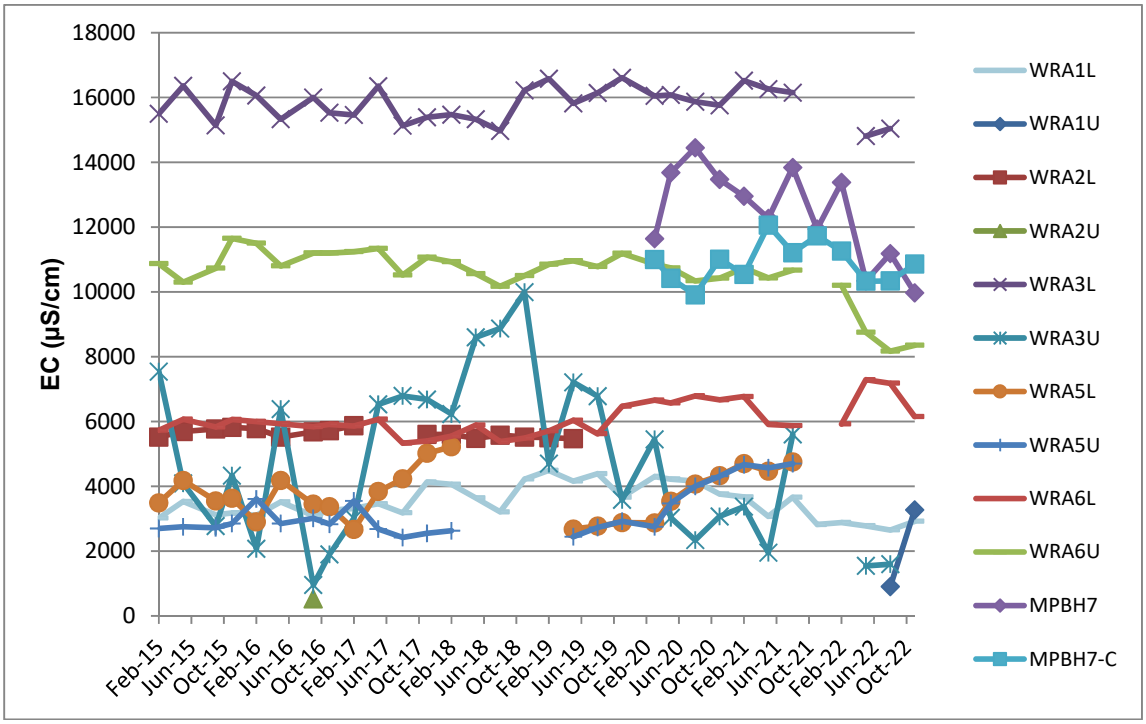

Chart 34: Groundwater Western Bores EC 2015 – 2022

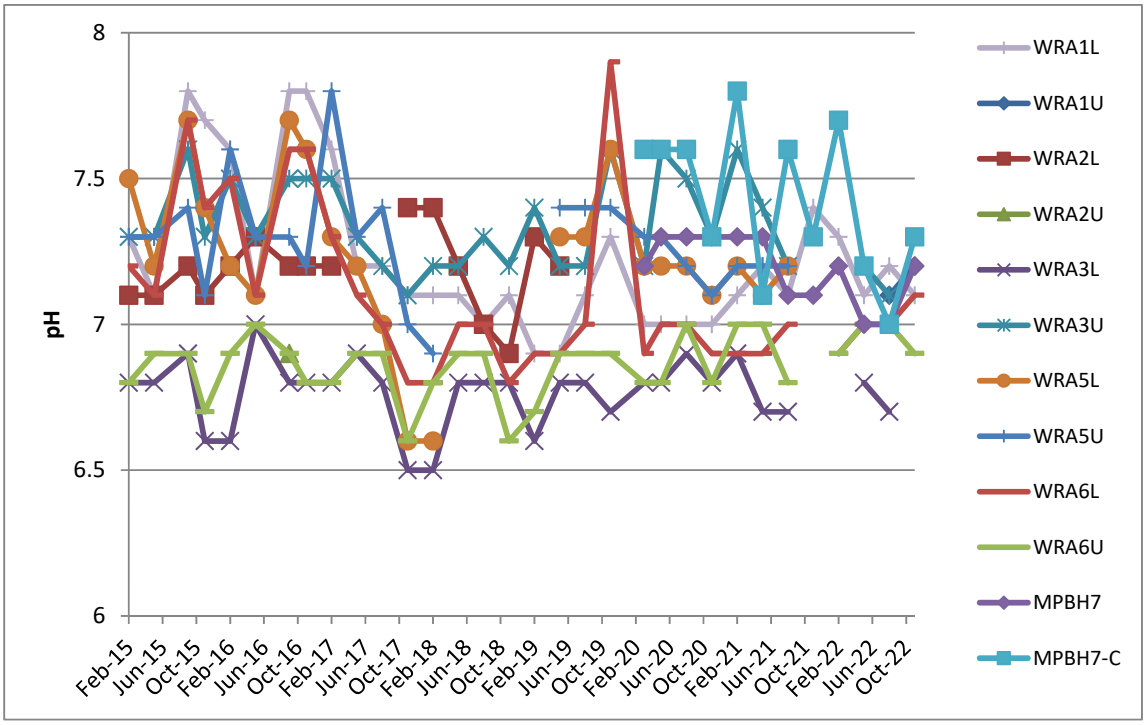

Chart 35: Groundwater Western Bores pH 2015 – 2022

During the reporting period, sites 3500B500L and 3500B500S continued to be blocked on all monitoring rounds. Monitoring was also not undertaken at 6000C000L due to insufficient water levels, and at 6000C000S, due to disturbance. No samples were taken in site MPBH5 due to dry conditions.

Sites MPBH1-C&HR, MPBH2-C&HR, MPBH4, MPBH4-C&HR, MPBH5, MPBH5-C&HR, MPBH6, MPBH6-C&HR, MPBH7 and MPBH7-C was added to the east and west of the MPO (Figure 7). Monitoring at the sites commenced on March 2020.

6.2.3 Trends and Key Management Implications

Monitored SWLs have stayed generally consistent from 2015 – 2022. SWL monitoring results remained generally consistent at all sites for the central and eastern bores. This is with the exception of sites 5000D000, where a decrease in water levels has been observed since May 2019, and sites 3500C500L, WRA3L, MPBH7, MPBH7-C and 5500D000 where the recorded water levels increased during the reporting period. Site 5000D000 monitors the Wynn and Edderton Seams to the west of the open cut pit, and therefore this decline is to be expected due to depressurisation in these strata.

The majority of EC values for the central bores have trended slightly downwards (Chart 28). Monitored EC values remained within historic ranges for the central bore sites.

EC values at eastern bores, which have been consistently measured for water quality since 2015 (MPBH-3B), remained generally within historic ranges during the reporting period (Chart 31). The newly installed bores (i.e. MPBH1-C&HR, MPBH2-C&HR, MPBH4, MPBH4-C&HR, MPBH5, MPBH5-C&HR, MPBH6, MPBH6-C&HR, MPBH7 and MPBH7-C) remained generally steady during the reporting period. This is with the exception of site MPBH6-C, which experienced a sharp drop and increase in EC during the reporting period. EC values at site MPBH3b and MPBH4-C slightly increased during the reporting period. Continuing from trends observed in the 2015, 2016, 2017, 2018, 2019, 2020 and 2021 Annual Reviews (Coal & Allied, 2016; MACH Energy, 2017b; MACH Energy, 2018; MACH Energy 2019; MACH

Energy, 2020; MACH Energy, 2021; MACH Energy, 2022), site WRA3U showed the most variation during the reporting period. Long term trends at the western bores indicate that yearly fluctuations in EC are most common at the western bores compared to the eastern and central bores (Coal & Allied, 2016; MACH Energy, 2017b; MACH Energy, 2018; MACH Energy, 2020; MACH Energy, 2021; MACH Energy, 2022). Site WRA3L showed higher EC levels than other western bores during the reporting period, which is consistent with recent years (MACH Energy, 2022).

Consistent with trends observed in the 2015, 2016, 2017, 2018, 2019, 2020 and 2021 Annual Reviews (Coal & Allied, 2016; MACH Energy, 2017b; MACH Energy, 2018; MACH Energy, 2019; MACH Energy, 2020; MACH Energy 2021; MACH Energy, 2022), the pH values for the majority of sites have generally remained within the pH range of 6.5 to 8.0 during the reporting period, with the exception of sites MPBH2-C, MPBH5-C, and MPBH1-C which recorded elevated pH levels during the reporting period. The pH for bores MPBH2-C and MPBH5-C has maintained a downward trend (approaching neutral) since installation in March 2020, however has increased in this reporting period. Bore MPBH5-C exceeded the pH trigger range during the May, August and November 2022 quarterly monitoring rounds. MACH will continue to monitor this trend and will establish trigger levels once the pH of the bores has equilibrated. The pH values recorded at site MPBH2-HR has remained within the pH range of 6.5 to 8.0 in this reporting period, consistent with the previous reporting period.

As described in Section 6.2.1, trigger levels have been developed as part of the approved WMP for EC and pH for all groundwater bores, with the exception of bores MPBH4, MPBH5, Melody and the newly installed monitoring bores[1]. As defined in Appendix 5 of the WMP (i.e. the Surface and Groundwater Response Protocol), monitored values outside the range of trigger levels for three consecutive monitoring rounds initiate the groundwater investigation protocol.

MPO complied with all SWL and pH criteria presented in the WMP during the reporting period.

From the previous reporting period, bore 5000D000 was determined to be compromised following exceedances of the EC trigger levels due to an obstruction at depth that prevents best practice for water monitoring (Australasian Groundwater and Environmental Consultants Pty Ltd [AGE], 2021). Additional groundwater monitoring was undertaken at bore 5000D000 during the February, May, August and September 2021 monitoring rounds, which showed persistent elevated readings at the bore (Table 25). A suitably qualified hydrogeologist was engaged and provided the following advice (AGE, 2021):

- There is no risk of environmental harm as a result of the elevated EC in the bore.
- The bore is compromised due to an obstruction at depth that prevents best practice water monitoring.
- The bore will be mined out due to the progressing pit.
- Bore 5000D000 is to be excluded from compliance monitoring.

Following this advice, a replacement monitoring bore was installed (5000D000-R) during this reporting period and data collected will be used for interpretative purposes only (not to be used for compliance as the new bore will also be within the expected mining drawdown extent). The bore will be included in the WMP in the next update.

The remainder of the MPO groundwater monitoring sites complied with the EC criteria presented in the WMP during the reporting period.

[1] Baseline trigger ranges for new bores will be developed once sufficient data (two years of monitoring) becomes available, and will be included in the next update of the WMP.

Table 25
5000D000 Groundwater Monitoring Results Summary

Sampling Event	Maximum beneficial use trigger value (EC) (µS/cm)	Electrical Conductivity (EC) (µS/cm)	Electrical Conductivity (EC) (µS/cm) (Laboratory QA/QC Sample)	Depth to Water (DTW) metres below ground (mBG)
August 2019	800	**820**	-	90.85
November 2019		**834**	-	97.89
March 2020		**840**	-	100.52
May 2020		**906**	**897**	100.82
August 2020		**966**	**957**	105.67
November 2020		**1231**	**1270**	106.65
February 2021		**1983**	-	109.15
May 2021		**4270**	-	113.85
August 2021		**3990**	-	116.47
November 2021		**4390**	-	117.24

Note: Results shown in **bold** Indicate that the bore has exceeded the adopted assessment criterion.

6.3 HUNTER RIVER SALINITY TRADING SCHEME DISCHARGES

MACH Energy has a total of 50 credits under the Hunter River Salinity Trading Scheme (HRSTS), however no discharges to the Hunter River occurred during the reporting period.

6.4 WATER TAKE

A total of 0 megalitres (ML) of water was taken from Hunter Regulated River Water Source for use at the MPO during the water reporting period (1 July 2021 – 30 June 2022) (Table 26). This was 752 ML less than the previous water reporting period. The water take from the Hunter Regulated River Water Source was 33,640 ML less than the MPO total entitlement (3,640 ML) (Table 26).

Table 26
MPO Water Take

Water Sharing Plan	Water Licence Number*	Entitlement	Total Pumping (ML)
Hunter Regulated River Water Source	1230	8	752.12
	1259	33	
	1227	99	
	1258	5	
	992	75	
	7808	36	
	702	267	
	1260	5	
	993	265	
	1308	15	
	604	183	
	605	8	
	677	24	
	1338	18	
	662	9	
	663	16	
	10775	243	
	41438	455	
	638	225	
	639	134	
	879	243	
	880	124	
	1113	366	
	973	3	
	974	210	
	975	8	
	988	156	
	989	8	
	1307	38	
	1229	480	

Note:

* several temporary licences were also used during the reporting period.

6.5 SITE WATER BALANCE

The Site Water Balance for the reporting period (i.e. 1 January 2022 to 31 December 2022) is provided in Table 27 in comparison to the 2021 site water balance.

The CHPP water demand increased from the previous reporting year due to an increase in ROM coal production and an increase in the volume and quality of product coal to be washed and prepared for railing. Continued increase in fine rejects bleed water was also associated with increase in fine rejects deposition from the CHPP. Surface water runoff also increased compared to the 2020 reporting period, due to the increased rainfall during the period and establishment of the expansion of the open cut pit footprint. Dust suppression was increased during the reporting period due to ongoing mine development and associated increases in haul road and stockpile areas, as well as dust suppression requirements associated with construction of MOD 4 infrastructure.

The recorded site water balance for the reporting period was generally consistent with MOD 3 predictions, with the exception of surface water runoff and fine rejects bleed water. Surface water runoff was greater than the MOD 3 predictions due to the above average rainfall across the year. Fine rejects bleed water was greater than the MOD 3 predictions due to the ramping up of the CHPP production rates due to the CHPP upgrades.

The initial five-year mine plan site water balance for the MPO was undertaken in 2019 and was updated in 2021 to be representative of current mine plan, catchment areas, new dam and water infrastructure, dam storages.

Table 27
MPO Annual Water Balance

	2021	2022
Water Sources	**Volume (ML/yr)**	**Volume (ML/yr)**
Surface Water Runoff	3929*	4256*
Groundwater	8*	3*
Fine Rejects Bleed Water	1442*	1954*
Hunter River Pumping (via WALs)	1135	0
Water Usage	**Volume (ML/yr)**	**Volume (ML/yr)**
CHPP Demand	4004	3233
Dust Suppression (Haul Road and Stockpiles)	1838	995
Vehicle Wash Demand	93.2	84
Water Loss	**Volume (ML/yr)**	**Volume (ML/yr)**
Discharge to Hunter River (via HRSTS)	0	0
Evaporation	1109.5*	1527*
Non Sediment Dam Spillage	0	0
Sediment Dam Spillage	0	<12

Note: ML/yr = Megalitres per year.

* This volume is calculated based on the current mine plan site water balance and adjusted accordingly with calculated rainfall over the reporting period(s); and MPO dam & open cut storage data.

7 REHABILITATION

Proposed rehabilitation activities for the MPO are defined in the RMP and associated Annual Rehabilitation Report and Forward Program, which has been developed to meet the requirements for an RMP (Condition 56, Schedule 3 of Development Consent DA 92/97).

On 1 August 2022, an RMP along with the supporting Annual Rehabilitation Report and Forward Program was prepared and submitted in accordance with the NSW Resource Regulator Form and Way – *Rehabilitation Management Plan for Large Mines* (July 2021), under amendment to the *Mining Regulation 2016* under the *Mining Act 1992*. The RMP and associated Annual Rehabilitation Report and Forward Program has replaced the MOP (1 July 2021 – 30 June 2023). This Annual Review reports against the RMP and Annual Rehabilitation Report and Forward Program.

Details of the activities completed during the reporting period are outlined in Section 3.1. At the end of the reporting period, the total mine disturbance area was approximately 1,066 hectares (ha), which was 19 ha more than the forecast disturbance area. The total rehabilitation area was approximately 131 ha, which was approximately 2 ha more than the rehabilitation area forecasted in the 2021 Annual Review.

The MPO at the time of reporting is on schedule to meet rehabilitation targets set out in the Forward Program by the end of the 3-year term (30 June 2023), as was the case for the 2021 reporting period.

Table 28 summarises the approximate disturbance and rehabilitation areas from the 2021 and 2022 reporting periods and provides an estimate of the forecast areas for the 2023 reporting period.

Table 28
Rehabilitation Status

Mine Area Type	Previous Reporting Period (ha Actual)	This Reporting Period (ha Actual)	Next Reporting Period (ha Forecast)
	2021	2022	2023
Total Mine Footprint[1,6]	1,145	1,197	1,212
Total Active Disturbance[2,6]	1,047	1,066	1,060
Land being prepared for Rehabilitation[3]	32.0	32.0	20.0
Land under active rehabilitation[4]	98.5	131	151
Completed rehabilitation[5]	0	0	0

1 Total mine footprint includes all areas within a mining lease that either have posed 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 the Division of Resources and Geoscience within the DPE [DRG] MOP Guidelines).

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 stockpile areas, access tracks and haul roads, active mining areas, overburden emplacements (active/unshaped/in or out-of-pit), and the FEA (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 DRG MOP 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 DRG MOP Guidelines – 'ecosystem and land use establishment" (area seeded OR surface developed in accordance with final land use) 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 the DRG that the area has successfully met the rehabilitation land use objectives and completion criteria.

6 Includes topsoil stockpiles.

Rehabilitation of the Eastern Out of Pit Emplacement continued in 2022. An additional 32.4 ha was rehabilitated (Plate 2), which included:

- bulk and detailed re-shaping of overburden material to final landform;
- installation of habitat features such as habitat/stag trees, log piles and rock piles across the rehabilitation area;
- topsoil spreading to a minimum depth of 100 mm;
- gypsum application at a rate of 10 tonnes per hectare (t/ha);
- deep ripping/tining along the contour of the final landform to a depth of 500 mm;
- planting of tubestock including ground, middle and upper stratum species of relevant target PCTs;
- direct/hand seeding of endangered ecological community tree/shrub/grass indicative species plus an additional grass cover crop; and
- planting of approximately 100 native trees per ha.

Rehabilitation areas were subject to ongoing weed and pest control measures throughout the reporting period to facilitate and promote successful vegetation establishment.

Plate 2: Eastern Out of Pit Emplacement Rehabilitation

Figure 2 shows the extent of active disturbance and rehabilitated areas at the end of the reporting period, as well as the forecast disturbance areas proposed in 2022.

The final land use goals for the MPO (as outlined within the current RMP and Forward Program) are as follows:

- successful design and rehabilitation of landforms to ensure structural stability, revegetation success and containment of wastes; and
- post-mining land use compatible with surrounding land uses.

The conceptual final landform across the MPO is an undulating, free draining and a less 'engineered' landform with an optimum post-mining land capability that supports low and high intensity agricultural land uses as well as grassland and woodland vegetation communities, as per the approved MOD 4 and current RMP. The MSC, the community and other stakeholders have indicated their preference for a landform that further integrates with the surrounding landscape. The MSC also indicated a preference for intensive agricultural/industrial post-mining land uses that provide employment for the local community.

The overarching objective for rehabilitation of the FEA is to establish a safe, stable and non-polluting landform with a sustainable surface cover that minimises erosion (to prevent exposure of the underlying fines material) and sustains grassland vegetation in the long-term. During the reporting period, MACH Energy operated the FEA using sub-aerial deposition which involves an extended period of air drying that maximises in-situ tailings densities, and in turn, maximises the storage efficiency of the facility as well as providing a more competent fines surface for future rehabilitation purposes.

During the reporting period, several former residential dwellings were demolished, and associated hazardous materials were removed and disposed off-site in accordance with the WasteMP.

7.1 EROSION AND SEDIMENT MANAGEMENT

General erosion and sediment management measures were undertaken during the reporting period in accordance with the erosion and sediment control provisions of the approved WMP and CEMP, and included:

- installation and management of sediment fencing around disturbance areas of soil stockpiles and sediment dams;
- implementation and management of progressive erosion and sediment control measures during the completion of MOD 4 construction works, including:
  - use of sediment fences and filters to intercept and filter small volumes of non-concentrated construction runoff;
  - progressive rehabilitation, monitoring and maintenance of ground disturbance areas near the Stage 1 Rail Demolition Area;
  - works to stabilise the creek crossing following culvert removal and rock reinstatement works near the Stage 1 Rail Demolition Area;
  - construction of rock check dams across swales and diversion channels to reduce the velocity of flow;
  - use of sediment basins to capture sediment and associated pollutants in construction runoff; and
  - use of scour protections where feasible;
- construction of diversion drains and bunds;
- regular inspections of the completed dams and erosion and sediment control structures; and
- sowing of all verges and drains.

MACH Energy undertook three internal erosion and sediment control inspections during the reporting period in March, May and October 2022, with a focus on the MOD 4 construction areas, as per the IEA recommendations completed during the 2020 reporting period (MACH Energy, 2022).

7.2 BUSHFIRE MANAGEMENT

The main objectives of bushfire management at the MPO are to minimise the risk of bushfires and to rapidly control any outbreaks that might occur. Control measures are in place to:

- minimise potential spreading of bushfires in and around the MPO;
- protect people, property and assets;
- protect areas of heritage value; and
- protect threatened fauna and/or flora.

The control measures implemented to prevent and manage bushfires focus on minimising the amount of fuel available at the MPO and its surrounding land. These measures include:

- slashing of vegetation along roads and internal tracks that are used as fire trails and assist in dividing the site into control zones;
- the use of livestock to reduce pasture-based fuel loads on land suitable for grazing; and
- maintaining a network of water supply points to assist the NSW Rural Fire Service with logistical support.

During the reporting period, a range of activities were undertaken in respect to fire preparation in accordance with the Bushfire Management Plan, including:

- community consultation with neighbouring landholders and lessees;
- maintenance of property, boundary and roadside firebreaks;
- updating signage along the fire trail;
- monthly inspections of the firebreaks and firefighting equipment at MPO during the fire season;
- Site visit with the NSW Rural Fire Service to drive the fire trail with the local fire truck; and
- the use of livestock to reduce pasture-based fuel loads on land suitable for grazing.

There were no major outbreaks of fire at the MPO during the reporting period.

7.3 REHABILITATION MONITORING

Various ecological works were undertaken at the MPO during the reporting period, including as part of the GDP process, and as part of flora and fauna surveys and assessments in support of a proposed State Significant Development (SSD) application. These works included mapping vegetation communities, searching for threatened flora species, communities and populations, and detailed floristic data collection at numerous survey plots.

The 2022 rehabilitation monitoring program was undertaken between 14 and 25 March 2022 and included monitoring of analogue and the MPO rehabilitation sites. The 2022 rehabilitation monitoring program was undertaken in accordance with the MPO Rehabilitation Monitoring Manual 2020 – 2022 (Ausecology, 2021). The MPO adopts a systems-based approach to rehabilitation monitoring (e.g. use of Ecosystem Function Analysis [Tongway and Ludwig, 2011]) to determine progress towards a self-sustaining ecosystem, including comparison to the analogue sites.

The rehabilitation research program at the MPO aims to incorporate management practices that have resulted from industry research into the establishment of woodland and grassland communities across mined landscapes, in particular in the Hunter Valley region.

MACH Energy is collaborating with the University of Newcastle on several rehabilitation related research projects including:

- a research project that aims to convert fines material into suitable topsoil material;
- a research project that analyses viability of various topsoil stockpile heights; and
- a research project that analyses MPO topsoil characteristics for input into the SIBERIA software program that supports geomorphic landform design modelling.

During the reporting period, the aforementioned projects were ongoing. Results for the topsoil characteristics project undertaken in 2022 are discussed in Section 5.9.

Further information regarding MPO rehabilitation monitoring methodologies is provided in the RMP and associated Annual Rehabilitation Report and Forward Program.

7.4 LAND MANAGEMENT

Landscape management included removal, erection and general maintenance of fence lines in the MPO.

During the reporting period, extensive tree planting was undertaken along the visual tree screen and other areas in accordance with the VIMP, to assist in shielding the site as outline in Section 5.10. General maintenance of these areas was also carried out throughout the reporting period.

Weed and pest control measures undertaken during the reporting period are outlined in Section 5.5.2. Topsoil management is discussed in Section 5.9.

8 COMMUNITY

MACH Energy's approach to community relations is focused on extending and strengthening the relationships that MACH Energy representatives have already formed with the local community.

MACH Energy released a community newsletter in March, June, September and December 2022 outlining the community activities undertaken during the reporting period. MACH Energy plans to continue to release regular community newsletters in the next reporting period to inform stakeholders/interested parties of activities at the MPO. MACH Energy also commenced distribution of the Rail Loop Project Community Newsletters until completion in October 2022. This information was distributed to local communities monthly throughout 2021 and 2022 to keep residents informed of construction and decommissioning activities.

During the reporting period, MACH Energy undertook community relations in four key areas: communication, consultation and engagement, community development, and relationships with the local Aboriginal community. These activities are outlined in detail in the following sections.

8.1 COMMUNICATION

Several points of communication have been established with the community. Members of the local community are encouraged to engage MACH Energy in the way that proves most convenient for them.

MACH Energy maintains a website (https://machenergyaustralia.com.au/) which is used to provide information to stakeholders and interested parties about the operation and environmental performance of the MPO. Information provided on the website includes key environmental management documentation, monthly environmental monitoring reports, an environmental complaints register (which is updated on a monthly basis), previous community newsletters, a new Projects Tab and CCC meeting minutes.

MACH Energy maintains a Community Hotline (1800 886 889), which is dedicated to the receipt of community complaints. The Community Hotline is publicly advertised in a variety of MACH Energy's public communication tools and is available during operating hours (i.e. 24/7), to receive any complaints. Communication received from the hotline is recorded in a Community and Stakeholder Engagement Database. This database records all necessary information regarding the nature of the communication, and if necessary, any action taken by MACH Energy as a result of the communication. A separate General Enquiries Hotline (1800 931 872) and Blasting Hotline (1800 931 873) have been in operation since 2018 and provide callers with general information about MACH Energy and blasting times and location.

A total of 35 community complaints were received during the reporting period (see Complaints Summary 2022: https://machenergyaustralia.com.au/mount-pleasant/documentation/) compared with 119 complaints received during the last reporting period and 116 complaints received during the 2020 reporting period. The community complaints for the reporting period related to:

- dust (1);
- noise (28);
- blasting (2);
- visual (1); and
- others (3) (related to odour).

Most of the complaints were received via the Community Hotline, however some complaints were made directly to the External Relations Manager, the Environmental Superintendent, the DPE, and the EPA. The total number of complaints has decreased significantly during the reporting period compared to 2021, likely due to the completion of the new Rail Loop, Train Load-Out and Hunter River Pump Station relocation as part of MOD 4. Chart 36 shows the total number of complaints since 2017. Chart 37 shows the total number of complaints by location and type during the reporting period.

The highest number of complaints received in 2022 were related to noise.

Complaints regarding blasting also decreased in 2022 in comparison to 2021. This can be attributed to the advancement of mining operations away from the community of Muswellbrook.

Thorough investigations were undertaken in response to all complaints. For noise-, air quality- and blasting-related complaints, real-time monitors were reviewed and alarms were examined. Following the investigation, the External Relations Manager made contact with the complainant in a timely manner to describe the MPO activities that may have been causing the issue and the response/s from MACH Energy. Activities were modified or ceased where necessary.

8.2 CONSULTATION AND ENGAGEMENT

A CCC is administered by MACH Energy, with a membership comprised of an independent chair, and appropriate representation from MACH Energy and the general community. One original committee member retired in 2021 and was replaced in March 2022 by a new community member following advertising for the position. The CCC is operated in general accordance with the *Community Consultative Committee Guidelines* (DPIE, 2016).

In 2022 with the return to “business as usual” following the Global COVID-19 pandemic, the CCC met four times during March, June, October, and December, two of which included a site tour (Plate 3). These meetings provided regular updates about the MPO, as well as an avenue to discuss aspects of the MPO that concerned community stakeholders. General discussions from these meetings related to:

- general overview of MPO progress;
- current status of approvals, management plans, modifications and supporting environmental documents;
- environmental monitoring and management;
- progress of land management activities at the MPO; and
- updates on community sponsorships, events, interactions and initiatives.

During the site visits undertaken during the reporting period, the CCC members visited the recently constructed train load out facility, rehabilitation progress, the fines emplacement facility, and the mining operation (Plate 3).

MACH Energy invites a range of its team members to present updates to the committee as direct contact enhances the two-way communication between both parties.

Full meeting minutes for the 2022 CCC meetings are provided on the MACH Energy website (https://machenergyaustralia.com.au/mount-pleasant/documentation/).

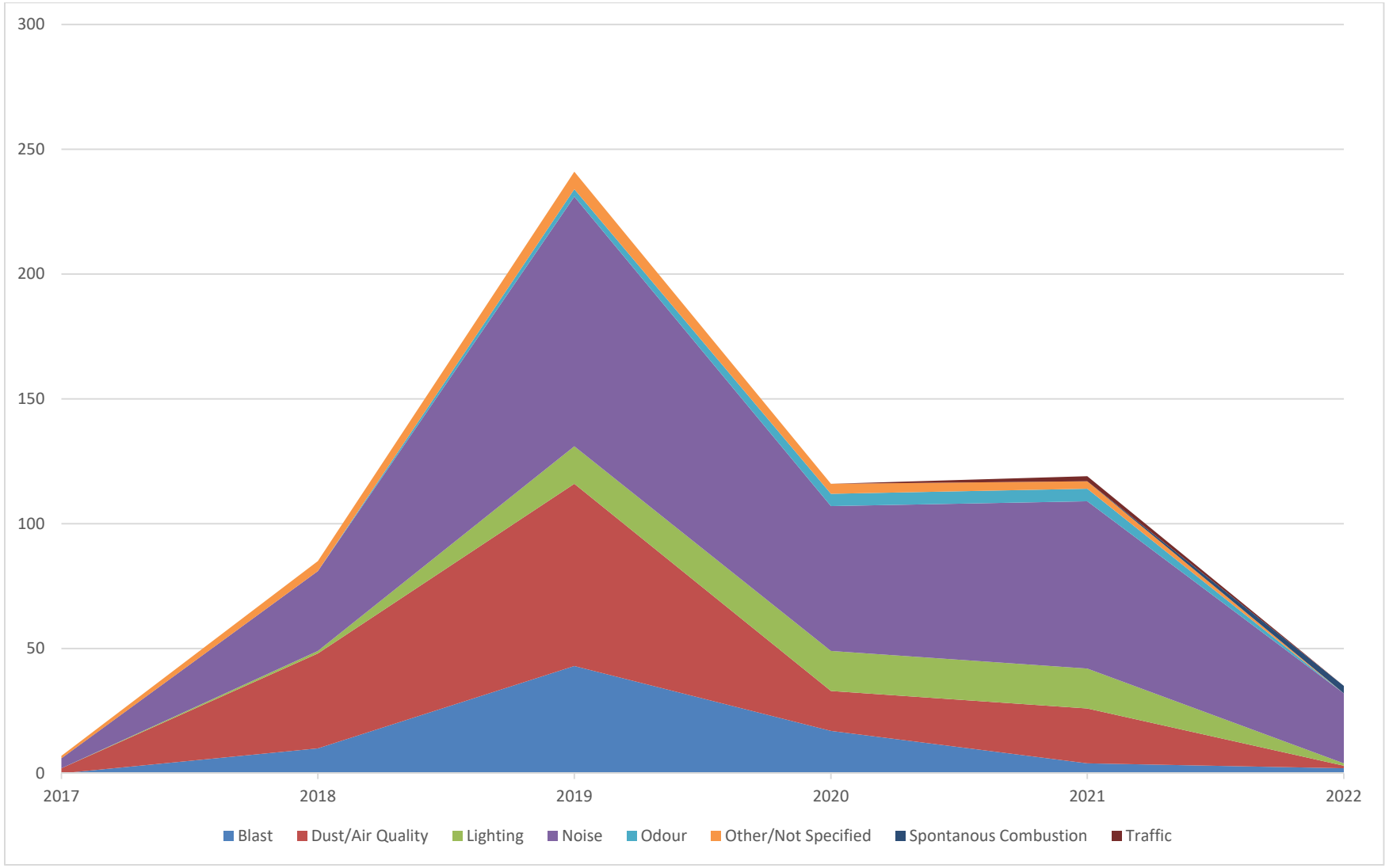

Chart 36: Complaints Analysis 2017-2022

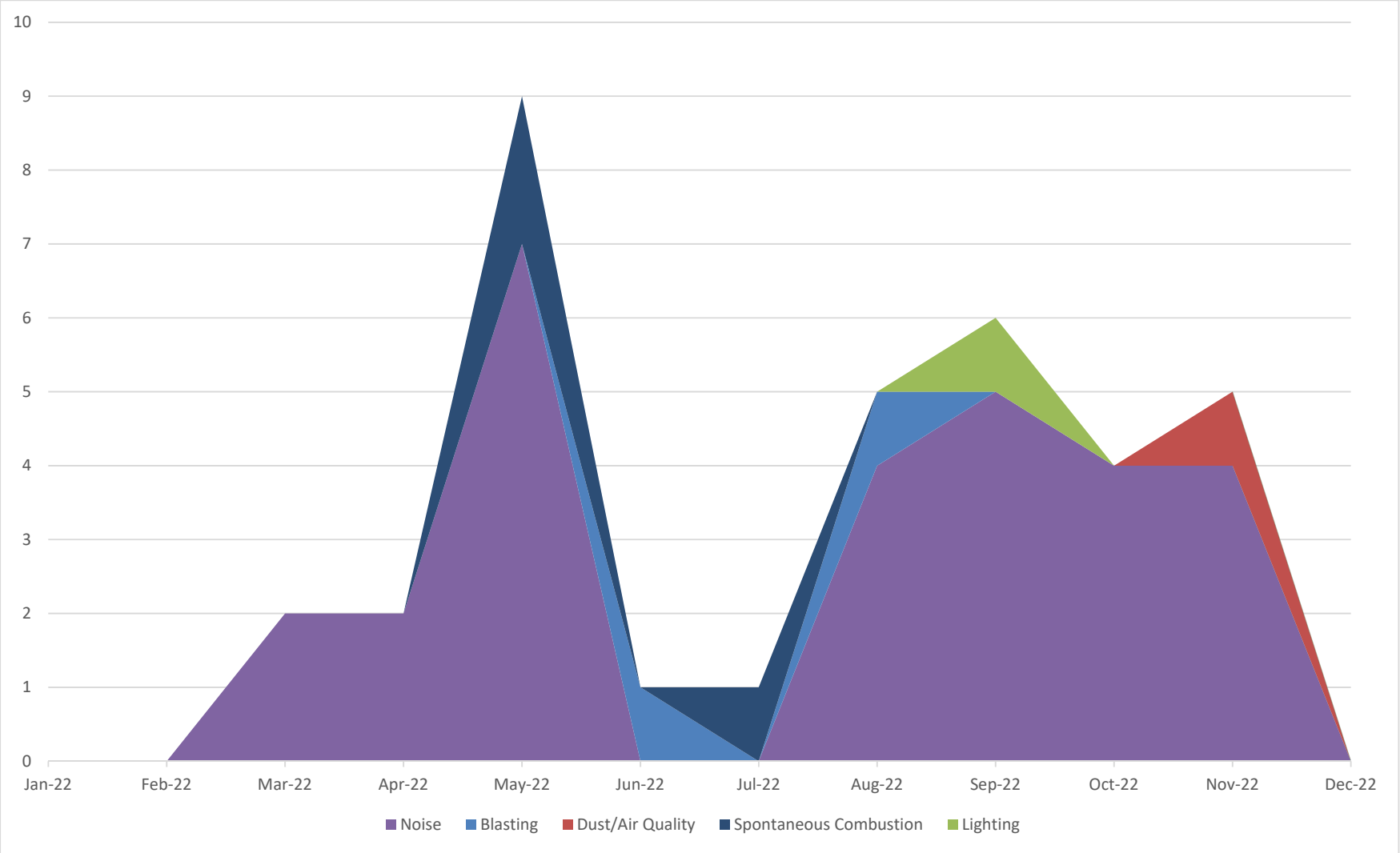

Chart 37: Complaints by Type 2022

Plate 3: The CCC visit the Mine Rehabilitation Area.

8.3 COMMUNITY DEVELOPMENT

As part of acquisition of the MPO, MACH Energy has maintained the Aboriginal Community Development Fund (ACDF) developed by Coal & Allied. The fund was a community benefit specified in the Native Title Agreement made with the Wonnarua People in 2005. Since its commencement in 2006, the ACDF has contributed more than $4 million into projects that benefit the Upper Hunter Valley Aboriginal community.

Since the acquisition, the MPO representatives have joined the existing ACDF community members to administer funds, manage its current projects and to seek-out new partnerships. An example of some of the key partnerships that were maintained during the reporting period as part of the ACDF are presented in Table 29.

Table 29
Aboriginal Community Development Fund Partnerships

Partner	Description
The Gundi Program	The Gundi Program was launched in 2011 and despite the impacts from COVID-19, the program has continued to expand and now includes a Cultural Program and the construction of a Cultural Space for all inmates to come together. Gundi aims to help Aboriginal inmates gain trades skills in custody and secure jobs once released. The Gundi Program builds hosing for remote communities, offices and abolition blocks for many local companies. The Gundi Program provides building qualifications and work experience for inmates whilst in custody.
Aboriginal Youth Empowerment Program	The Aboriginal Youth Empowerment Program sees the continuation of the employment of an Aboriginal Youth Program Mentor. Now in its third year, the Mentor works with Singleton and Muswellbrook Policy Citizen Youth Clubs (PCYC) local schools and organisations to assist the youth in the Upper Hunter region. Among many tasks, the mentor weekly activity programs, in consultation with local stakeholders and Aboriginal community members, identifies and addresses key issues for the youth. This includes personal safety, belonging and cultural sensitivity.
The Cultural Spectacular (Plate 4)	The Cultural Spectacular is a bi-annual event and was held in 2022 following three cancellations due to COVID-19. A free, family event from 12 PM to 9 PM, the Cultural Spectacular included Aboriginal bands and entertainers, cultural talks and activities, Aboriginal artists and dance groups from local schools to professionals. The event attracted approximately 2000 attendees and will be held again in Muswellbrook in 2024.

Plate 4: ACDF Cultural Spectacular

8.4 RELATIONSHIPS WITH LOCAL ABORIGINAL COMMUNITY

MACH Energy works closely with the local Aboriginal community, including undertaking regular consultation with the RAPs. MACH Energy maintains a contact register, containing up to date contact details for the 88 RAPs, and is committed to maintaining ongoing consultation with these RAPs throughout the life of the MPO.

As outlined in Section 5.6.2, during 2022 archaeological salvages were carried out under AHIP #C0002092, AHIP #C0002053 and AHIP#C0004783 in accordance with the AHMP. RAPs had a strong presence in these salvage activities.

8.5 OTHER CONTRIBUTIONS TO COMMUNITY

- Community sponsorships including Westpac Rescue Helicopter – Annual Charity Golf Day, Annual Rescue Ball, NAIDOC Week Awards and Community Activities, NAIDOC Small Schools Events, Muswellbrook and Kayuga Rural Fire Service Firies Santa Run 2022.
- Sport sponsorships including Westpac Rescue Charity Rugby League with participation from the Mount Pleasant Phoenix team, Merriwa Polocrosse, Merriwa Campdraft, Muswellbrook Cats AFL Men's and Women's, Scone Rugby Union, Upper Hunter District Cricket Association, Belltrees Cricket Club, Singleton 0'35's Soccer, Aberdeen Rugby League Club, Denman Senior & Junior Cricket Association, Denman Rugby League, Muswellbrook Junior and Senior Rugby League and Muswellbrook Netball.
- School sponsorships including St James' Primary School End of Year Presentation, Muswellbrook High School End of Year Presentation, Muswellbrook Primary School End of Year Presentation, Aberdeen Primary School End of Year Presentation, Denman Primary School End of Year Presentation, Muswellbrook Toastmasters (Plate 5).
- International Women's Day, National Breast Cancer Awareness, International Men's Day, R U OK? Day.
- Assisted with the facilitation of four Upper Hunter Mining Dialogue school mine tours for local primary and high school students.

Plate 5: Sponsorship of the St Mary's Catholic Primary School Scone - Yarning Circle and Garden

9 INDEPENDENT ENVIRONMENTAL AUDIT

No IEA was undertaken during the reporting period.

Notwithstanding, some recommendations from the IEA completed during the 2020 reporting period (submitted to DPE on 18 June 2020) were addressed during this reporting period. A summary of the IEA recommendations addressed during the reporting period and the outstanding actions are provided in Table 30.

In accordance with Condition 9, Schedule 5 of Development Consent DA 92/97, MACH Energy will commission, commence and pay for the full cost of an IEA, which will be conducted on 7 and 8 March 2022. The findings of the IEA will be discussed in the next reporting period.

Table 30
Summary of the Outstanding Actions from the 2021 Independent Environmental Audit Recommendations and MACH Energy's Responses

Item No.	Audit Recommendation	MACH Energy Response
Development Consent DA 92/97 S3 C 26	Issue ID8 There is an area where a drainage structure has failed near the MIA/workshop areas. This area flows into the mine water management system and does not go off site. This requires replacement and engineering advice. Issue ID9 The CHPP requires erosion and sediment control review. SLR Consulting Australia Pty Ltd (SLR) understand a significant amount of money has been set aside for this work and engineering designs are progressing. This area flows into the mine water management system and does not go off site. Implement the actions of the engineering review. Ensure the designs also include a review of the drains that fall just outside the CHPP area (near the Rejects Road). These are older degraded drainage lines. Note, since the Audit inspection some of these areas have been remediated. However additional work is still required in this area.	Remediation of the drainage structures was completed in the previous reporting period. An internal audit was undertaken upon completion of the remediation works. Works to update the mine water management and erosion and sediment control systems at the CHPP commenced during the previous reporting period and continued during the reporting period. SLR undertook three internal erosion and sediment control inspections during the reporting period in March, May and October 2022. Continuous monitoring of the Dam ED MIA spillway area was undertaken during the reporting period and MACH Energy continue to adopt a risk-based approach to rehabilitate the area (i.e. line the area with jute mesh to minimise the risk of future erosion). Actions proposed by SLR during the internal erosion and sediment control inspections were implemented in the reporting period and will continue during the next reporting period.
Development Consent DA 92/97 S3 C 33	REC: Continue the process of progressing the covenant for the Aboriginal Conservation Area.	An application for the transfer of Aboriginal objects for safe keeping was approved on 2 November 2022. This Care Agreement allows for the transfer of objects within AHIP #C0002053, AHIP #C0004783 and AHIP #C0002092 from the Broomfield Homestead Complex to Ascot Farm. The security of Aboriginal Heritage Conservation Area A is being finalised in consultation with DPE and it is anticipated that this process will be completed during the next reporting period.

Table 30 (continued)
Summary of the Outstanding Actions from the 2021 Independent Environmental Audit Recommendations and MACH Energy's Responses

Item No.	Audit Recommendation	MACH Energy Response
Development Consent DA 92/97 S3 C 54	REC: Update the relevant document (MOP/RMP or Rehabilitation Strategy) to ensure there are no inconsistencies with the documents.	The MOP was previously prepared and approved by the NSW Resources Regulator on 24 June 2021. The revised Rehabilitation Strategy was also prepared to incorporate updates to maintain consistency with the MOP and approved on 24 February 2022. However, as of 1 August 2022, the MOP (1 July 2021 – 30 June 2023) was replaced with an RMP along with the supporting Annual Rehabilitation Report and Forward Program.

10 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

10.1 ENVIRONMENTAL INCIDENTS

The following reportable incident occurred during the reporting period:

- Water discharge events on 8 March 2022 and 21 October 2022 (Section 10.2).
- Spontaneous combustion event on 6 May 2022 (Section 5.12).
- Blast overpressure exceedance on 2 September 2022 (Section 5.3.2).
- Noise exceedance event on 17 November 2022 (Section 5.2.3).

10.2 NON-COMPLIANCES

A summary of non-compliances and potential non-compliances during the reporting period (i.e. 1 January – 31 December 2022), and, if applicable, the actions taken in response to the non-compliances, is outlined in Table 31. Outstanding non-compliances and actions from the previous Annual Review are also outlined in Table 31.

Table 31
Compliance Summary

Approval Document Reference	Observation	Action/Comment
Development Consent DA 92/97 Condition S3 C3	Attended monitoring on 27 August 2021 identified a sustained exceedance (measurements at 00:18 and 00:54) of the $L_{A1(1\ minute)}$ criterion at monitoring location N-AT4.	Following the incident, MACH Energy notified the DPE and EPA of the potential exceedances of noise criteria on 1 September 2021. Warning letter was received from DPE for non-compliance on 24 November 2021. However, no further action was required by the DPE. MACH Energy followed the NMP procedure and modified operations upon notification of the exceedance. MACH Energy also notified (in writing) the affected landowners and tenants of the potential exceedance and undertook additional $L_{A1(1\ minute)}$ monitoring during September – November 2021 monitoring rounds closer to the affected landowners and tenants. The outcomes of the additional $L_{A1(1\ minute)}$ monitoring surveys were communicated to DPE and the affected landowners and tenants in December 2021. No notification from DPE was received after the correspondence letter in December 2021. This matter is now considered closed.
Development Consent DA 92/97 Condition S3 C15 EPL 20850 L4.6	A blast fume event occurred after a blast on 15 June 2020. Three complaints were received after the blast and regulatory action by the EPA.	Following the incident, MACH Energy undertook an investigation into the cause of the incident to the DPE and EPA. As a result of the investigation, the mining contractor amended key pre-blast procedures to reduce the potential for a similar event to occur in the future. This included adjustment of the fume probability prediction model, additional surveillance cameras/drones and updates to the blasting Trigger Action Response Plan. The Blast Management Plan was reviewed following the fume event in June 2020 and several corrective actions were implemented in the drill and blast design process and protocols within the Trigger Action Response Plan. No change to the Blast Management Plan was necessary because of this review. The DPE was notified on 30 June 2021 and no further action was required.

Table 31 (Continued)
Compliance Summary

Approval Document Reference	Observation	Action/Comment
Development Consent DA 92/97 Condition S3 C18 EPL 20850 L5.1	A complaint was received regarding a spontaneous combustion event on 6 May 2022.	Complaint received directly to the External Relations Manager's mobile phone. Complainant discussed spontaneous combustion from the Mount Pleasant Operation. Upon receiving the complaint, the operation was inspected by the OCE and mining manager. An area of heated material was identified on the Pit A low wall. During the inspection it was determined that accessing the heated material was a high-risk activity and a detailed risk assessment was conducted to work above a large body of water. Upon completion of the risk assessment, a dozer was used to cut down the low wall to cover the heated material with inert material. This occurred on 10 May 2022. Heated material within the active working areas will continue to be managed in accordance with the Mount Pleasant Spontaneous Combustion Principal Hazard Management Plan. The MPO mining contractor is committed to minimizing the impacts of the development and modifying operations on site to ensure compliance with relevant conditions in the Development Consent DA 92/97 and EPL 20850.

Table 31 (Continued)
Compliance Summary

Approval Document Reference	Observation	Action/Comment
EPL 20850 L4.3	A blast overpressure of 122.7 dBA was recorded at monitoring location B-VOA on 2 September 2022. No complaints were received after the blast.	Following the incident, MACH Energy undertook an investigation into the cause and self-reported the incident via email on the same day at 16:03 to DPE and EPA with subsequent report provided on 9 September 2022. From the investigation, MACH Energy notes that the elevated overpressure result is not an exceedance of its operating condition in either the Development Consent DA 92/97, EPL 20850 of the BMP, as there are no privately owned residences in the area of B-VOA. From this report, DPE advised on 30 September 2022 that at a minimum, MACH Energy should review blast procedures. MACH Energy proposed to relocate B-VOA under the EPL 20850 Variation for the purpose of monitoring impacts to residents on privately owned land to the north and east of the MPO. Blast procedures were reviewed, and no changes were necessary as the results are used primarily for information and risk management purposes. Residential receivers to the north and east have existing monitors in place. The EPA has since issued a variation to EPL 20850 removing the blast monitor as an EPA Monitoring Point.

Table 31 (Continued)
Compliance Summary

Approval Document Reference	Observation	Action/Comment
Development Consent DA 92/97 Condition S3 C26	Discharge of sediment laden water from Sediment Dams 1,4,6 and 7, and Temporary Sediment Basin 2 occurred on 8 March 2022. 72 hours prior to the discharge event, 145.6 mm of rainfall was recorded at the A-PF2 meteorological station.	Following the incident, MACH Energy undertook an investigation into the cause and advised DPE of the non-compliance on 15 March 2022. DPE was advised that the surface water run off to the dams exceeded the dam's respective design capacities. During the incident, MACH Energy pumped water from the sediment dams to the mine water system to reduce the volume and duration of the overflow. DPE confirmed in writing on 20 April 2022 that no enforcement action would be taken as the incident resulted in minimal impact on the environment and remedial actions were in place to minimize the recurrence and impact of similar incidents. In accordance with Condition 4, Schedule 5 of the Development Consent DA 92/97, the WMP was updated on 24 October 2022 following completion of an internal review undertaken by MACH Energy.

Table 31 (Continued)
Compliance Summary

Approval Document Reference	Observation	Action/Comment
Development Consent DA 92/97 Condition S3 C26 EPL 20850 L1.1	A spillway discharge was observed on 21 October 2022 from Sediment Dam 4. The A-PF2 meteorological station recorded 34 mm between the hours of 01:00 AM on 20 October 2022 to 09:30 AM on 21 October 2022. The A-PF4 meteorological station recorded 39.4 mm during the same period. A possible 1 in 5-year event was triggered, with MPO receiving 9.2 mm of rain within a 5–10 minute period.	Following the incident, MACH Energy undertook observation and field measurements of water quality during the discharge event at all dams. The results indicate the water was generally of “good” quality, that is, pH between 7.2 – 7.6; EC of approximately 350 µS/cm; and turbidity was observed to be “slightly turbid”. The results of the preliminary investigation indicate there were no adverse impacts to the surrounding community or any environmental harm due to the water release. The receiving environment is the Kayuga Road Culvert and Hunter River Flood Catchment. MACH Energy commenced an investigation into this event and provided outcomes to EPA on 28 October 2022. From the investigation, field observations during the release event, laboratory analytical data, and Hunter River Water Quality/flow levels at the time of the rainfall event provide supporting evidence to indicate there was no adverse impact to the local community or receiving environment because of the water release. The DPE requested in the next Independent Environmental Audit (due Q1 2023) a review of all sediment dam discharges. This will be reported in the next reporting period.
Development Consent DA 92/97 Condition S3 C3 EPL 20850 L3.1	On 17 November 2022, an investigation was triggered as a result of sustained exceedance (measurements at 00:11 and 00:42) of the LA1(1 minute) criterion at monitoring location N-AT4 and N-AT5, during monthly attended compliance monitoring.	Following the incident, additional attended monitoring was commissioned by MACH Energy and subsequent readings at N-AT5 returned measurements below the relevant noise criteria. As a result of the noise exceedance event at N-AT4, consultation with the affected landowners and tenants was conducted and the proposed course of action by MACH Energy is outlined in Section 5.2.3. MACH Energy followed the NMP procedure and no environmental harm occurred and no complaints were received.

Table 31 (Continued)
Compliance Summary

Approval Document Reference	Observation	Action/Comment
Development Consent DA 92/97 Condition S3 C26	Intense rainfall occurred on 8 December 2021 (24.2 mm in a 30 minute period with a total of 47.8 mm in a 9 hour period) causing four sediment basins (namely Sediment Dams [SD] 4, 6 and 7 and Environmental Dam [ED] 2.) to spill water offsite.	Following the rainfall events, MACH Energy undertook an investigation into the cause and self-reported the incidents to the DPE and EPA. Water quality sampling was undertaken during the events, with water quality showing negligible changes in release water in pH, EC and TSS. MACH Energy undertook actions to mitigate the impact of discharges prior to the rainfall event, including regular inspections and dewatering of sediment dams through pumping to the mine water system. Regular inspections of erosion and sediment controls were implemented and undertaken prior to and during forecasted heavy rainfall events, in addition to regular third-party inspections by a CPESC. Immediate actions following the incidents included pumping to reduce the quantity and duration of the discharge event, with pumping already having commenced on 3 of the 4 dams prior to the event. The initial investigation indicated that no environmental harm occurred. No complaints were received. Final outcomes of the investigation include increased capacity of the dams and increased pumping capacity.
Development Consent DA 92/97 Condition S3 C26	Intense rainfall occurred on 9 December 2021 (47.8 mm with a 1 in 10 year event triggered) causing four sediment basins at the MPO, namely SD 4, 6 and 7 and ED 2 to spill water offsite.	

11 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Key activities to be completed during the next reporting period include:

- Installation of new bore holes to replace WRA3U&L.
- Approval of EPBC Approval 2011/5795 Variation.
- Approval of EPL 20850 Variation and revision of monitoring locations in the WMP and BMP (Section 5.3.2 and Section 6).
- Continued consultation regarding the potential Aboriginal Heritage Conservation Areas.
- Continued collaboration with the University of Newcastle on various rehabilitation related research projects as described in Section 7.3.
- IEA to occur in accordance with Condition 9, Schedule 5 of Development Consent DA 92/97.

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APPENDIX A

NOISE MONITORING SUMMARY 2022

Table A1
$L_{Aeq,15minute}$ Attended Noise Monitoring Summary 2022

Monitoring Location/Period		Jan[1]	Feb[2]	Mar[3]	Apr[4]	May[5]	Jun[6]	Jul[7]	Aug[8]	Sep[9]	Oct[10]	Nov[11]	Dec[12]
N-AT1	Night	IA	<25 dBA	IA	IA	NM	IA	37 dBA	IA	IA	IA	IA	IA
N-AT2	Night	26	IA	27 dBA	<20 dBA	25 dBA	IA	<20 dBA	28 dBA	IA	31dBA	<25 dBA	IA
N-AT3	Night	IA	IA	IA	<25 dBA	IA	37 dBA	25 dBA	IA	IA	IA	36	35
N-AT4	Night	IA	38 dBA	IA	IA	IA	36 dBA	37 dBA	IA	IA	IA	40 dBA 40 dBA*	39
N-AT5	Night	IA	33 dBA	IA	IA	IA	<30 dBA	39 dBA	28 dBA	IA	IA	36 dBA 31 dBA*	34
N-AT6	Night	IA	<20 dBA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA

Note:
dBA = A-weighted decibels.
IA = Inaudible.
NM = Not measurable.
Indicates criteria were not applicable due to meteorological conditions at the time of measurement.
Bold values indicate exceedance of criterion.
Measurements undertaken on the following dates:
[1]: 24 January. [2]: 9 February. [3]: 15 March. [4]: 28 April. [5]: 19 May. [6]: 16 and 17 June. [7]: 25 July. [8]: 9 August. [9]: 7 September. [10]: 17 October. [11]: 16 and 17 November.[12]: 6 and 7 December.
* A second measurement was taken for November at N-AT4 and N-AT5 due to an exceedance of the $L_{Aeq,15minute}$ criterion.

Table A2
$L_{A1,1minute}$ Attended Noise Monitoring Summary 2022

Monitoring Location/Period		Jan[1]	Feb[2]	Mar[3]	Apr[4]	May[5]	Jun[6]	Jul[7]	Aug[8]	Sep[9]	Oct[10]	Nov[11]	Dec[12]
N-AT1	Night	IA	<25 dBA	IA	IA	NM	IA	41 dBA	IA	IA	IA	IA	IA
N-AT2	Night	30 dBA	IA	31 dBA	<20 dBA	33 dBA	43 dBA	<20 dBA	30 dBA	IA	34 dBA	30 dBA	IA
N-AT3	Night	IA	IA	IA	<25 Dba	IA	38 dBA	<30 dBA	IA	IA	IA	41 dBA	40
N-AT4	Night	IA	45 dBA	IA	IA	IA	<30 dBA	44 dBA	IA	IA	IA	**58 dBA** **61 dBA***	45
N-AT5	Night	IA	36 dBA	IA	IA	IA	IA	43 dBA	40 dBA	IA	IA	**49 dBA** 40 dBA*	37
N-AT6	Night	IA	<25 dBA	IA	IA	IA	IA	IA	IA	IA	IA	IA	IA

Note:
dBA = A-weighted decibels.
IA = Inaudible.
NM = Not measurable.
Indicates criteria were not applicable due to meteorological conditions at the time of measurement.
Bold values indicate exceedance of criterion.
Measurements undertaken on the following dates:
[1]: 24 January. [2]: 9 February. [3]: 15 March. [4]: 28 April. [5]: 19 May. [6]: 16 and 17 June. [7]: 25 July. [8]: 9 August. [9]: 7 September. [10]: 17 October. [11]: 16 and 17 November.[12]: 6 and 7 December.
* A second measurement was taken for November at N-AT4 and N-AT5 due to an exceedance of the $L_{A1,1minute}$ criterion.

Table A3
Cumulative Mining Noise Monitoring Summary 2022

Monitoring Location/Period		Jan[1]	Feb[2]	Mar[3]	Apr[4]	May[5]	Jun[6]	Jul[7]	Aug[8]	Sep[9]	Oct[10]	Nov[11]	Dec[12]
N-AT1	Night	Nil	Nil	Nil	Nil	Nil	Nil	40 dBA	Nil	Nil	Nil	Nil	Nil
N-AT2	Night	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-AT3	Night	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-AT4	Night	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	40 dBA 40 dBA*	Nil
N-AT5	Night	Nil	Nil	Nil	Nil	Nil	NM	Nil	Nil	Nil	Nil	37 dBA 37 dBA*	35
N-AT6	Night	Nil	Nil	Nil	Nil	Nil	NM	Nil	Nil	Nil	Nil	Nil	Nil

Note:

dBA = A-weighted decibels.

IA = Inaudible.

NM = Not measurable.

Nil = Only one source of noise present, or MPO did not contribute to total mining noise levels.

Indicates criteria were not applicable due to meteorological conditions at the time of measurement.

Bold values indicate exceedance of criterion.

Measurements undertaken on the following dates:

[1]: 24 January. [2]: 9 February. [3]: 15 March. [4]: 28 April. [5]: 19 May. [6]: 16 and 17 June. [7]: 25 July. [8]: 9 August. [9]: 7 September. [10]: 17 October. [11]: 16 and 17 November.[12]: 6 and 7 December.

* A second measurement was taken for November at N-AT4 and N-AT5 due to low-frequency modifying factors being applicable at the time.

APPENDIX B

BLASTING SUMMARY 2022

MPO Blast Monitoring Summary – 2022

Date Fired	Time Fired	Vibration (mm/s) BVOA	Overpressure (dBL) BVOA	Vibration (mm/s) BVOC	Overpressure (dBL) BVOC	Vibration (mm/s) BVO2	Overpressure (dBL) BVO2	Blast Fume Compliant
Thursday 6/01/2022	13:47	0.27	109.4	0.16	102.0	0.49	104.5	Y
Wednesday 12/01/2022	13:05	0.91	92.8	0.26	84.7	0.66	94.1	Y
Friday 14/01/2022	13:27	2.24	97.2	1.47	90.4	1.62	95.9	Y
Tuesday 18/01/2022	13:10	0.01	93.5	0.01	87.5	0.00	95.8	Y
Thursday 20/01/2022	10:59	1.33	111.7	0.62	116.0	0.45	91.1	Y
Thursday 27/01/2022	12:57	0.11	93.9	0.11	89.8	0.28	96.3	Y
Friday 28/01/2022	09:07	0.39	98.0	0.36	92.8	0.23	95.2	Y
Wednesday 2/02/2022	13:15	0.65	100.7	0.33	94.9	0.55	98.4	Y
Thursday 3/02/2022	12:57	0.02	94.0	0.01	98.6	0.01	77.9	Y
Friday 4/02/2022	09:31	0.88	105.8	0.99	99.7	0.85	92.1	Y
Friday 11/2/2022	14:20	0.18	97.8	0.15	86.3	0.51	105.4	Y
Monday 14/02/2022	13:10	0.30	92.3	0.28	91.1	0.30	89.1	Y
Wednesday 16/02/2022	13:31	0.31	101.4	0.30	90.4	0.52	93.6	Y

MPO Blast Monitoring Summary – 2022 (continued)

Date Fired	Time Fired	Vibration (mm/s) BVOA	Overpressure (dBL) BVOA	Vibration (mm/s) BVOC	Overpressure (dBL) BVOC	Vibration (mm/s) BVO2	Overpressure (dBL) BVO2	Blast Fume Compliant
Friday 18/02/2022	10:12	0.48	96.6	0.27	88.3	0.76	96.9	Y
Friday 25/02/2022	09:40	0.69	100.0	0.53	99.6	0.80	95.3	Y
Thursday 3/03/2022	13:13	0.21	95.9	0.11	93.3	0.28	101.4	Y
Monday 7/03/2022	13:00	0.47	96.0	0.38	94.6	0.37	96.4	Y
Monday 14/03/2022	13:33	0.19	97.4	0.19	98.8	0.26	101.2	Y
Thursday 17/03/2022	13:50	0.11	91.0	0.09	86.6	0.29	92.3	Y
Thursday 24/03/2022	13:02	0.75	105.2	0.46	97.9	0.42	101.3	Y
Friday 25/03/2022	12:23	0.28	98.7	0.28	96.8	0.44	94.4	Y
Tuesday 29/03/2022	13:03	0.39	98.6	0.34	95.1	0.43	93.9	Y
Saturday 2/04/2022	10:10	0.03	86.3	0.01	98.1	0.00	76.9	Y
Thursday 7/04/2022	13:39	0.39	94.7	0.44	91.2	0.68	99.4	Y
Friday 8/04/2022	13:09	0.02	108.7	0.01	100.6	0.01	97.5	Y
Tuesday 12/04/2022	13:13	0.20	99.7	0.23	91.8	0.41	97.5	Y

MPO Blast Monitoring Summary – 2022 (continued)

Date Fired	Time Fired	Vibration (mm/s) BVOA	Overpressure (dBL) BVOA	Vibration (mm/s) BVOC	Overpressure (dBL) BVOC	Vibration (mm/s) BVO2	Overpressure (dBL) BVO2	Blast Fume Compliant
Thursday 14/04/2022	12:02	0.38	95.9	0.50	94.4	0.38	95.9	Y
Friday 22/04/2022	15:29	1.55	105.2	0.86	110.0	0.92	105.4	Y
Wednesday 27/04/2022	13:01	0.98	98.8	0.62	93.1	0.44	93.3	Y
Friday 29/04/2022	12:25	0.44	92.2	0.17	83.4	0.44	93.9	Y
Tuesday 3/05/2022	13:02	0.49	100.1	0.62	90.0	0.30	96.1	Y
Thursday 5/05/2022	15:17	0.28	95.7	0.15	89	0.39	98.7	Y
Tuesday 10/05/2022	13:10	0.41	102.4	0.36	103.6	0.30	99.2	Y
Thursday 12/05/2022	09:38	1.77	100.2	0.75	95.2	0.96	97.4	Y
Tuesday 17/05/2022	13:10	0.16	96.9	0.15	96	0.27	93.7	Y
Thursday 19/05/2022	13:12	0.87	101.1	0.81	92	0.86	100.5	Y
Wednesday 25/05/2022	13:19	0.41	98.2	0.25	90.9	0.43	95.4	Y
Friday 27/05/2022	12:08	0.57	102.2	0.38	100.5	0.28	103.1	Y
Thursday 2/06/2022	13:11	0.56	102.5	0.60	100.2	0.6	100.2	Y
Wednesday 8/06/2022	13:13	0.13	108.1	0.09	112.6	0.19	100.6	Y

MPO Blast Monitoring Summary – 2022 (continued)

Date Fired	Time Fired	Vibration (mm/s) BVOA	Overpressure (dBL) BVOA	Vibration (mm/s) BVOC	Overpressure (dBL) BVOC	Vibration (mm/s) BVO2	Overpressure (dBL) BVO2	Blast Fume Compliant
Thursday 9/06/2022	13:04	0.58	104.8	0.19	105.4	0.26	106.9	Y
Friday 17/06/2022	12:10	0.04	90.8	0.01	78.7	0.01	87.2	Y
Friday 24/06/2022	12:11	0.54	101.8	0.47	111.6	0.67	109.9	Y
Wednesday 29/06/2022	13:52	0.36	100.4	0.56	93.6	0.56	102.0	Y
Friday 1/07/2022	13:07	0.02	103.0	0.01	94.2	0.01	97.6	Y
Friday 15/07/2022	12:08	2.45	104.9	1.36	94.2	1.00	103.4	Y
16/07/2022 Saturday	13:05	0.39	96.0	0.19	87.1	0.37	93.3	Y
21/07/2022 Thursday	13:29	0.04	100.8	0.03	106.4	0.00	103.3	Y
Friday 22/07/2022	13:56	0.86	112.5	0.59	107.1	0.37	99.0	Y
Friday 29/07/2022	12:34	1.13	97.0	0.47	98.3	0.53	98.7	Y
Wednesday 3/08/2022	10:09	2.45	111.3	1.36	101.1	1.10	110.9	Y
Thursday 4/08/2022	13:11	0.02	89.5	0.01	79.8	0.00	99.0	Y
Friday 5/08/2022	13:34	0.01	86.6	0.01	86.6	0.00	100.1	Y
Tuesday 9/08/2022	13:17	0.02	86.0	0.01	90.4	0.00	84.7	Y

MPO Blast Monitoring Summary – 2022 (continued)

Date Fired	Time Fired	Vibration (mm/s) BVOA	Overpressure (dBL) BVOA	Vibration (mm/s) BVOC	Overpressure (dBL) BVOC	Vibration (mm/s) BVO2	Overpressure (dBL) BVO2	Blast Fume Compliant
Friday 12/08/2022	12:15	0.82	107.4	0.65	106.1	0.41	98.3	Y
Wednesday 24/08/2022	13:13	2.71	101.3	1.42	91.0	1.53	104.3	Y
Wednesday 31/08/2022	13:11	0.52	100.8	0.50	94.0	0.40	97.0	Y
Friday 2/09/2022	09:08	0.46	122.7	0.41	110.9	0.36	107.1	Y
Thursday 8/09/2022	13:19	0.45	97.9	0.33	95.5	0.34	94.8	Y
Tuesday 13/09/2022	13:06	0.51	94.3	0.23	86.9	0.33	94.5	Y
Wednesday 14/09/2022	13:09	1.18	112.7	1.56	102.3	0.68	97.4	Y
Friday 16/09/2022	12:12	1.32	106.0	0.90	108.8	0.42	107.6	Y
Tuesday 20/09/2022	13:16	0.54	105.9	0.30	99.2	0.37	94.6	Y
Friday 23/09/2022	12:03	1.53	104.9	0.75	98.4	0.45	98.4	Y
Thursday 29/09/2022	15:00	0.45	93.0	0.26	88.6	0.47	90.1	Y
Thursday 6/10/2022	13:04	0.25	99.3	0.16	90.6	0.29	95.5	Y
Friday 7/10/2022	11.59	0.25	95.7	0.16	88.3	0.21	90.1	Y

MPO Blast Monitoring Summary – 2022 (continued)

Date Fired	Time Fired	Vibration (mm/s) BVOA	Overpressure (dBL) BVOA	Vibration (mm/s) BVOC	Overpressure (dBL) BVOC	Vibration (mm/s) BVO2	Overpressure (dBL) BVO2	Blast Fume Compliant
Wednesday 12/10/2022	14:07	0.51	106.9	0.47	97.8	0.33	89.5	Y
Saturday 15/10/2022	09:03	1.24	113.9	1.43	101.6	0.42	97.2	Y
Wednesday 19/10/2022	11:07	0.89	100.8	0.66	92.1	0.64	95.6	Y
Thursday 20/10/2022	10:46	0.21	96.9	0.13	97.4	0.21	92.1	Y
Thursday 27/10/2022	14:14	0.76	100.7	0.36	91.4	0.40	102.2	Y
Wednesday 2/11/2022	14:16	0.60	107.6	0.45	107.5	0.54	106.2	Y
Friday 4/11/2022	14:34	0.39	111.3	0.16	97.5	0.27	99.1	Y
Monday 7/11/2022	12:58	0.64	95.7	0.32	86.1	0.46	93.5	Y
Wednesday 9/11/2022	12:14	0.94	101.0	0.51	99.4	0.82	91.7	Y
Thursday 10/11/2022	14:45	0.78	95.2	0.24	95.6	1.73	94.2	Y
Tuesday 15/11/2022	14:18	0.43	101.7	0.27	104.4	0.47	99.6	Y
Wednesday 16/11/2022	13:10	0.36	104.4	0.18	102.0	0.25	96.4	Y
Friday 18/11/2022	12:11	0.51	96.6	0.28	94.7	0.32	92.6	Y

MPO Blast Monitoring Summary – 2022 (continued)

Date Fired	Time Fired	Vibration (mm/s) BVOA	Overpressure (dBL) BVOA	Vibration (mm/s) BVOC	Overpressure (dBL) BVOC	Vibration (mm/s) BVO2	Overpressure (dBL) BVO2	Blast Fume Compliant
Tuesday 22/11/2022	12:15	0.02	99.3	0.03	102.7	0.03	108.8	Y
Wednesday 23/11/2022	15:33	0.50	108.9	0.30	113.4	0.45	103.7	Y
Friday 25/11/2022	12:35	0.73	97.6	0.76	89.7	0.73	101.5	Y
Tuesday 29/11/2022	13:03	0.25	89.9	0.12	85.3	0.17	92.1	Y
Wednesday 30/11/2022	15:54	1.03	106	0.48	106.6	0.56	98.7	Y
Friday 2/12/2022	12:15	0.02	91.7	0.01	95.5	0.00	102.9	Y
Tuesday 6/12/2022	16:48	1.24	101	0.51	100.6	0.46	100	Y
Thursday 8/12/2022	13:29	0.43	109	0.33	105.4	0.28	101.8	Y
Thursday 15/12/2022	16:35	1.26	100	0.63	94.2	0.66	97.1	Y
Friday 16/12/2022	12:13	0.95	98.1	0.52	96.1	0.87	101.4	Y
Wednesday 21/12/2022	11:14	0.89	106.6	0.42	96.5	0.40	103.5	Y
Thursday 22/12/2022	13:07	0.68	98.7	0.55	91.8	0.68	99.5	Y
Friday 23/12/2022	12:06	0.94	102.8	0.46	94	0.77	98.7	Y

APPENDIX C

RAIL MOVEMENT SUMMARY 2022

Train Movement - Time in	Train Movement - Time Out
Fri, 31 Dec 2021, 21:43	Sat, 1 Jan 2022, 02:23
Sat, 1 Jan 2022, 00:51	Sat, 1 Jan 2022, 07:34
Sat, 1 Jan 2022, 04:37	Sat, 1 Jan 2022, 10:42
Sat, 1 Jan 2022, 10:10	Sat, 1 Jan 2022, 12:42
Sat, 1 Jan 2022, 11:51	Sat, 1 Jan 2022, 18:07
Sat, 1 Jan 2022, 14:31	Sat, 1 Jan 2022, 22:55
Sat, 1 Jan 2022, 23:05	Sun, 2 Jan 2022, 01:39
Sat, 1 Jan 2022, 23:35	Sun, 2 Jan 2022, 07:49
Sun, 2 Jan 2022, 02:14	Sun, 2 Jan 2022, 10:28
Sun, 2 Jan 2022, 11:51	Sun, 2 Jan 2022, 15:56
Sun, 2 Jan 2022, 12:31	Sun, 2 Jan 2022, 18:07
Sun, 2 Jan 2022, 17:31	Sun, 2 Jan 2022, 22:08
Sun, 2 Jan 2022, 19:55	Mon, 3 Jan 2022, 03:59
Mon, 3 Jan 2022, 02:24	Mon, 3 Jan 2022, 08:10
Mon, 3 Jan 2022, 04:12	Mon, 3 Jan 2022, 08:45
Mon, 3 Jan 2022, 08:58	Mon, 3 Jan 2022, 13:14
Mon, 3 Jan 2022, 12:27	Mon, 3 Jan 2022, 17:05
Mon, 3 Jan 2022, 19:11	Mon, 3 Jan 2022, 23:22
Mon, 3 Jan 2022, 21:43	Tue, 4 Jan 2022, 01:46
Tue, 4 Jan 2022, 09:57	Tue, 4 Jan 2022, 13:42
Tue, 4 Jan 2022, 14:31	Tue, 4 Jan 2022, 18:25
Tue, 4 Jan 2022, 19:11	Tue, 4 Jan 2022, 23:22
Wed, 5 Jan 2022, 02:14	Wed, 5 Jan 2022, 06:47
Wed, 5 Jan 2022, 04:31	Wed, 5 Jan 2022, 09:02
Wed, 5 Jan 2022, 08:07	Wed, 5 Jan 2022, 13:14
Wed, 5 Jan 2022, 16:25	Wed, 5 Jan 2022, 18:36
Wed, 5 Jan 2022, 19:11	Wed, 5 Jan 2022, 22:52
Thu, 6 Jan 2022, 07:21	Thu, 6 Jan 2022, 23:22
Fri, 7 Jan 2022, 00:51	Fri, 7 Jan 2022, 06:10
Fri, 7 Jan 2022, 08:51	Fri, 7 Jan 2022, 10:58
Fri, 7 Jan 2022, 11:13	Fri, 7 Jan 2022, 15:56
Fri, 7 Jan 2022, 22:17	Sat, 8 Jan 2022, 00:22
Sat, 8 Jan 2022, 05:58	Sat, 8 Jan 2022, 10:10
Sat, 8 Jan 2022, 11:51	Sat, 8 Jan 2022, 14:57
Sat, 8 Jan 2022, 17:21	Sat, 8 Jan 2022, 21:32
Sun, 9 Jan 2022, 00:31	Sun, 9 Jan 2022, 02:33
Sun, 9 Jan 2022, 12:31	Sun, 9 Jan 2022, 14:57
Sun, 9 Jan 2022, 22:17	Mon, 10 Jan 2022, 02:07
Mon, 10 Jan 2022, 03:01	Mon, 10 Jan 2022, 05:43
Mon, 10 Jan 2022, 16:01	Mon, 10 Jan 2022, 18:07
Mon, 10 Jan 2022, 19:11	Mon, 10 Jan 2022, 23:22
Tue, 11 Jan 2022, 04:12	Tue, 11 Jan 2022, 06:34
Tue, 11 Jan 2022, 07:21	Tue, 11 Jan 2022, 10:58
Tue, 11 Jan 2022, 20:01	Tue, 11 Jan 2022, 23:22
Wed, 12 Jan 2022, 12:26	Wed, 12 Jan 2022, 17:48
Wed, 12 Jan 2022, 16:25	Wed, 12 Jan 2022, 22:08
Thu, 13 Jan 2022, 04:31	Thu, 13 Jan 2022, 12:31
Thu, 13 Jan 2022, 07:21	Thu, 13 Jan 2022, 17:48
Fri, 14 Jan 2022, 00:51	Fri, 14 Jan 2022, 03:22
Fri, 14 Jan 2022, 08:34	Fri, 14 Jan 2022, 13:17
Fri, 14 Jan 2022, 14:51	Fri, 14 Jan 2022, 17:48
Fri, 14 Jan 2022, 16:05	Fri, 14 Jan 2022, 22:08
Sat, 15 Jan 2022, 03:11	Sat, 15 Jan 2022, 05:44
Sat, 15 Jan 2022, 17:31	Sat, 15 Jan 2022, 21:02
Sun, 16 Jan 2022, 11:51	Sun, 16 Jan 2022, 15:56
Sun, 16 Jan 2022, 06:57	Sun, 16 Jan 2022, 10:28
Sun, 16 Jan 2022, 16:05	Sun, 16 Jan 2022, 20:28
Sun, 16 Jan 2022, 20:11	Sun, 16 Jan 2022, 22:22
Wed, 19 Jan 2022, 18:16	Wed, 19 Jan 2022, 22:52
Wed, 19 Jan 2022, 20:41	Thu, 20 Jan 2022, 02:38
Thu, 20 Jan 2022, 04:31	Fri, 21 Jan 2022, 01:02
Fri, 21 Jan 2022, 03:11	Fri, 21 Jan 2022, 07:56
Fri, 21 Jan 2022, 11:51	Fri, 21 Jan 2022, 15:56
Fri, 21 Jan 2022, 19:21	Fri, 21 Jan 2022, 23:22
Sat, 22 Jan 2022, 04:12	Sat, 22 Jan 2022, 08:36
Sat, 22 Jan 2022, 10:01	Sat, 22 Jan 2022, 14:57
Sat, 22 Jan 2022, 13:01	Sat, 22 Jan 2022, 18:07

Month End	Total Tonnage Transported from MPO (t)
2022	
January	724,647
February	399,116
March	519,452
April	524,162
May	576,390
June	523,637
July	442,834
August	580,077
September	592,680
October	463,035
November	545,172
December	831,982

Sat, 22 Jan 2022, 20:41	Sun, 23 Jan 2022, 00:15
Sat, 22 Jan 2022, 23:35	Sun, 23 Jan 2022, 04:42
Sun, 23 Jan 2022, 06:57	Sun, 23 Jan 2022, 10:28
Sun, 23 Jan 2022, 09:41	Sun, 23 Jan 2022, 14:57
Sun, 23 Jan 2022, 14:31	Sun, 23 Jan 2022, 18:39
Sun, 23 Jan 2022, 22:17	Mon, 24 Jan 2022, 01:59
Mon, 24 Jan 2022, 04:21	Mon, 24 Jan 2022, 11:00
Mon, 24 Jan 2022, 06:41	Mon, 24 Jan 2022, 13:14
Mon, 24 Jan 2022, 12:31	Mon, 24 Jan 2022, 16:51
Tue, 25 Jan 2022, 02:14	Tue, 25 Jan 2022, 06:47
Tue, 25 Jan 2022, 08:34	Tue, 25 Jan 2022, 13:57
Tue, 25 Jan 2022, 12:14	Tue, 25 Jan 2022, 18:25
Tue, 25 Jan 2022, 19:01	Tue, 25 Jan 2022, 22:50
Wed, 26 Jan 2022, 00:03	Wed, 26 Jan 2022, 04:34
Wed, 26 Jan 2022, 14:01	Wed, 26 Jan 2022, 17:48
Wed, 26 Jan 2022, 19:21	Wed, 26 Jan 2022, 23:22
Thu, 27 Jan 2022, 03:31	Thu, 27 Jan 2022, 07:05
Thu, 27 Jan 2022, 09:31	Thu, 27 Jan 2022, 13:14
Thu, 27 Jan 2022, 21:43	Fri, 28 Jan 2022, 01:59
Fri, 28 Jan 2022, 01:32	Fri, 28 Jan 2022, 06:55
Fri, 28 Jan 2022, 15:26	Fri, 28 Jan 2022, 19:43
Fri, 28 Jan 2022, 19:01	Sat, 29 Jan 2022, 00:22
Fri, 28 Jan 2022, 23:03	Sat, 29 Jan 2022, 03:36
Sat, 29 Jan 2022, 02:11	Sat, 29 Jan 2022, 07:34
Sat, 29 Jan 2022, 08:21	Sat, 29 Jan 2022, 14:42
Sat, 29 Jan 2022, 18:20	Sat, 29 Jan 2022, 23:25
Sat, 29 Jan 2022, 23:05	Sun, 30 Jan 2022, 03:22
Sun, 30 Jan 2022, 10:19	Sun, 30 Jan 2022, 14:57
Mon, 31 Jan 2022, 03:50	Mon, 31 Jan 2022, 09:53
Mon, 31 Jan 2022, 10:03	Mon, 31 Jan 2022, 13:42
Mon, 31 Jan 2022, 12:31	Mon, 31 Jan 2022, 18:07
Tue, 1 Feb 2022, 06:21	Tue, 1 Feb 2022, 09:56
Tue, 1 Feb 2022, 14:31	Tue, 1 Feb 2022, 18:25
Tue, 1 Feb 2022, 20:21	Tue, 1 Feb 2022, 23:54
Wed, 2 Feb 2022, 07:11	Wed, 2 Feb 2022, 11:21
Wed, 2 Feb 2022, 16:25	Wed, 2 Feb 2022, 23:22
Fri, 4 Feb 2022, 19:01	Fri, 4 Feb 2022, 23:22
Sat, 5 Feb 2022, 16:05	Sun, 6 Feb 2022, 03:57
Sun, 6 Feb 2022, 06:47	Sun, 6 Feb 2022, 10:28
Sun, 6 Feb 2022, 17:31	Sun, 6 Feb 2022, 22:22
Mon, 7 Feb 2022, 02:57	Mon, 7 Feb 2022, 07:16
Fri, 11 Feb 2022, 07:30	Fri, 11 Feb 2022, 12:40
Fri, 11 Feb 2022, 14:31	Fri, 11 Feb 2022, 21:34
Fri, 11 Feb 2022, 23:03	Sat, 12 Feb 2022, 02:53
Sat, 12 Feb 2022, 04:46	Sat, 12 Feb 2022, 08:36
Sat, 12 Feb 2022, 11:51	Sat, 12 Feb 2022, 16:12
Sat, 12 Feb 2022, 20:21	Sun, 13 Feb 2022, 00:36
Sun, 13 Feb 2022, 04:31	Sun, 13 Feb 2022, 08:05
Sun, 13 Feb 2022, 08:51	Sun, 13 Feb 2022, 13:14
Mon, 14 Feb 2022, 17:21	Mon, 14 Feb 2022, 21:03
Tue, 15 Feb 2022, 00:51	Tue, 15 Feb 2022, 05:00
Tue, 15 Feb 2022, 07:51	Tue, 15 Feb 2022, 13:11
Tue, 15 Feb 2022, 09:51	Tue, 15 Feb 2022, 15:56
Tue, 15 Feb 2022, 14:31	Tue, 15 Feb 2022, 21:03
Tue, 15 Feb 2022, 18:16	Tue, 15 Feb 2022, 23:54
Wed, 16 Feb 2022, 00:51	Wed, 16 Feb 2022, 05:00
Wed, 16 Feb 2022, 04:31	Wed, 16 Feb 2022, 09:02
Wed, 16 Feb 2022, 07:27	Wed, 16 Feb 2022, 12:40
Wed, 16 Feb 2022, 12:51	Wed, 16 Feb 2022, 16:51
Wed, 16 Feb 2022, 23:51	Thu, 17 Feb 2022, 03:21
Thu, 17 Feb 2022, 05:51	Thu, 17 Feb 2022, 14:57
Thu, 17 Feb 2022, 16:25	Thu, 17 Feb 2022, 21:03
Thu, 17 Feb 2022, 19:11	Fri, 18 Feb 2022, 00:36
Thu, 17 Feb 2022, 23:03	Fri, 18 Feb 2022, 05:00
Fri, 18 Feb 2022, 04:31	Fri, 18 Feb 2022, 08:19
Fri, 18 Feb 2022, 11:51	Fri, 18 Feb 2022, 17:05
Fri, 18 Feb 2022, 18:48	Fri, 18 Feb 2022, 23:22
Fri, 18 Feb 2022, 21:43	Sat, 19 Feb 2022, 03:57
Sat, 19 Feb 2022, 03:31	Sat, 19 Feb 2022, 08:05

Sat, 19 Feb 2022, 22:31	Sun, 20 Feb 2022, 02:33
Sun, 20 Feb 2022, 04:31	Sun, 20 Feb 2022, 08:05
Sun, 20 Feb 2022, 09:41	Sun, 20 Feb 2022, 13:14
Sun, 20 Feb 2022, 12:11	Sun, 20 Feb 2022, 17:46
Mon, 21 Feb 2022, 00:11	Mon, 21 Feb 2022, 07:44
Mon, 21 Feb 2022, 03:11	Mon, 21 Feb 2022, 10:58
Mon, 21 Feb 2022, 16:25	Tue, 22 Feb 2022, 05:00
Wed, 23 Feb 2022, 07:00	Fri, 25 Feb 2022, 19:55
Thu, 24 Feb 2022, 04:35	Thu, 24 Feb 2022, 13:22
Thu, 24 Feb 2022, 12:35	Thu, 24 Feb 2022, 19:55
Fri, 25 Feb 2022, 04:25	Fri, 25 Feb 2022, 13:22
Fri, 25 Feb 2022, 12:25	Sat, 26 Feb 2022, 01:35
Sat, 26 Feb 2022, 02:23	Sat, 26 Feb 2022, 07:34
Sat, 26 Feb 2022, 03:50	Sat, 26 Feb 2022, 10:10
Sat, 26 Feb 2022, 10:19	Sat, 26 Feb 2022, 14:57
Sat, 26 Feb 2022, 13:35	Sat, 26 Feb 2022, 18:17
Sat, 26 Feb 2022, 19:01	Sat, 26 Feb 2022, 22:55
Sun, 27 Feb 2022, 02:14	Sun, 27 Feb 2022, 06:55
Sun, 27 Feb 2022, 05:21	Sun, 27 Feb 2022, 10:28
Sun, 27 Feb 2022, 10:19	Sun, 27 Feb 2022, 14:57
Sun, 27 Feb 2022, 19:35	Sun, 27 Feb 2022, 23:26
Mon, 28 Feb 2022, 00:11	Mon, 28 Feb 2022, 03:57
Mon, 28 Feb 2022, 03:11	Mon, 28 Feb 2022, 09:02
Mon, 28 Feb 2022, 08:34	Mon, 28 Feb 2022, 14:42
Mon, 28 Feb 2022, 14:21	Mon, 28 Feb 2022, 18:05
Mon, 28 Feb 2022, 19:11	Mon, 28 Feb 2022, 23:22
Mon, 28 Feb 2022, 21:43	Tue, 1 Mar 2022, 03:57
Tue, 1 Mar 2022, 02:14	Tue, 1 Mar 2022, 10:30
Tue, 1 Mar 2022, 07:11	Tue, 1 Mar 2022, 11:32
Tue, 1 Mar 2022, 12:01	Tue, 1 Mar 2022, 16:10
Tue, 1 Mar 2022, 14:31	Tue, 1 Mar 2022, 19:47
Tue, 1 Mar 2022, 19:11	Wed, 2 Mar 2022, 00:08
Wed, 2 Mar 2022, 08:34	Wed, 2 Mar 2022, 13:14
Wed, 2 Mar 2022, 11:51	Wed, 2 Mar 2022, 18:03
Wed, 2 Mar 2022, 18:16	Wed, 2 Mar 2022, 23:22
Thu, 3 Mar 2022, 04:14	Fri, 4 Mar 2022, 00:36
Thu, 3 Mar 2022, 22:17	Fri, 4 Mar 2022, 04:34
Fri, 4 Mar 2022, 03:08	Fri, 4 Mar 2022, 10:58
Fri, 4 Mar 2022, 08:51	Fri, 4 Mar 2022, 12:40
Sat, 5 Mar 2022, 05:58	Sat, 5 Mar 2022, 10:42
Sun, 6 Mar 2022, 12:31	Sun, 6 Mar 2022, 16:43
Wed, 9 Mar 2022, 06:50	Wed, 9 Mar 2022, 21:42
Thu, 10 Mar 2022, 05:50	Thu, 10 Mar 2022, 13:22
Thu, 10 Mar 2022, 05:55	Thu, 10 Mar 2022, 22:16
Fri, 11 Mar 2022, 05:50	Fri, 11 Mar 2022, 13:22
Fri, 11 Mar 2022, 08:45	Sat, 12 Mar 2022, 01:35
Sat, 12 Mar 2022, 04:05	Sat, 12 Mar 2022, 10:50
Sat, 12 Mar 2022, 11:45	Sat, 12 Mar 2022, 18:15
Sat, 12 Mar 2022, 23:15	Sun, 13 Mar 2022, 10:36
Sun, 13 Mar 2022, 07:01	Sun, 13 Mar 2022, 18:28
Mon, 14 Mar 2022, 01:25	Mon, 14 Mar 2022, 04:15
Mon, 14 Mar 2022, 20:35	Tue, 15 Mar 2022, 01:10
Tue, 15 Mar 2022, 02:05	Tue, 15 Mar 2022, 13:22
Wed, 16 Mar 2022, 00:25	Wed, 16 Mar 2022, 05:08
Wed, 16 Mar 2022, 15:48	Wed, 16 Mar 2022, 19:55
Wed, 16 Mar 2022, 22:45	Thu, 17 Mar 2022, 02:46
Sat, 19 Mar 2022, 07:05	Sat, 19 Mar 2022, 13:22
Sun, 20 Mar 2022, 02:55	Sun, 20 Mar 2022, 11:56
Sun, 20 Mar 2022, 06:55	Sun, 20 Mar 2022, 14:50
Sun, 20 Mar 2022, 13:30	Mon, 21 Mar 2022, 04:15
Mon, 21 Mar 2022, 12:25	Mon, 21 Mar 2022, 17:56
Tue, 22 Mar 2022, 02:16	Tue, 22 Mar 2022, 11:19
Tue, 22 Mar 2022, 14:25	Tue, 22 Mar 2022, 21:42
Wed, 23 Mar 2022, 02:27	Wed, 23 Mar 2022, 07:24
Wed, 23 Mar 2022, 08:15	Wed, 23 Mar 2022, 11:54
Thu, 24 Mar 2022, 16:15	Thu, 24 Mar 2022, 23:30
Fri, 25 Mar 2022, 03:05	Fri, 25 Mar 2022, 06:26
Fri, 25 Mar 2022, 09:45	Fri, 25 Mar 2022, 13:22
Fri, 25 Mar 2022, 14:15	Fri, 25 Mar 2022, 16:59

Fri, 25 Mar 2022, 23:15	Sat, 26 Mar 2022, 02:31
Sat, 26 Mar 2022, 12:25	Sat, 26 Mar 2022, 15:05
Sat, 26 Mar 2022, 15:46	Sat, 26 Mar 2022, 18:15
Sat, 26 Mar 2022, 22:25	Sun, 27 Mar 2022, 01:47
Sun, 27 Mar 2022, 00:25	Sun, 27 Mar 2022, 04:15
Sun, 27 Mar 2022, 11:06	Sun, 27 Mar 2022, 13:36
Sun, 27 Mar 2022, 14:25	Sun, 27 Mar 2022, 16:51
Sun, 27 Mar 2022, 19:23	Sun, 27 Mar 2022, 22:16
Sun, 27 Mar 2022, 20:45	Mon, 28 Mar 2022, 01:35
Mon, 28 Mar 2022, 05:03	Mon, 28 Mar 2022, 09:10
Mon, 28 Mar 2022, 09:35	Mon, 28 Mar 2022, 13:50
Mon, 28 Mar 2022, 17:35	Mon, 28 Mar 2022, 21:42
Mon, 28 Mar 2022, 23:15	Tue, 29 Mar 2022, 02:29
Tue, 29 Mar 2022, 05:42	Tue, 29 Mar 2022, 08:58
Tue, 29 Mar 2022, 07:15	Tue, 29 Mar 2022, 11:19
Tue, 29 Mar 2022, 11:55	Tue, 29 Mar 2022, 14:50
Tue, 29 Mar 2022, 14:25	Tue, 29 Mar 2022, 18:26
Tue, 29 Mar 2022, 19:05	Tue, 29 Mar 2022, 23:30
Wed, 30 Mar 2022, 04:25	Wed, 30 Mar 2022, 11:16
Wed, 30 Mar 2022, 10:46	Wed, 30 Mar 2022, 15:16
Wed, 30 Mar 2022, 12:55	Wed, 30 Mar 2022, 21:11
Wed, 30 Mar 2022, 20:15	Thu, 31 Mar 2022, 02:07
Thu, 31 Mar 2022, 01:45	Thu, 31 Mar 2022, 13:22
Thu, 31 Mar 2022, 05:55	Thu, 31 Mar 2022, 15:05
Fri, 1 Apr 2022, 02:50	Fri, 1 Apr 2022, 08:04
Fri, 1 Apr 2022, 04:05	Fri, 1 Apr 2022, 13:08
Fri, 1 Apr 2022, 14:25	Fri, 1 Apr 2022, 19:24
Fri, 1 Apr 2022, 20:45	Sat, 2 Apr 2022, 07:42
Sat, 2 Apr 2022, 15:46	Sat, 2 Apr 2022, 22:16
Sun, 3 Apr 2022, 03:05	Sun, 3 Apr 2022, 08:13
Sun, 3 Apr 2022, 11:45	Sun, 3 Apr 2022, 16:51
Mon, 4 Apr 2022, 03:25	Mon, 4 Apr 2022, 08:03
Fri, 8 Apr 2022, 06:20	Fri, 8 Apr 2022, 11:16
Fri, 8 Apr 2022, 12:05	Fri, 8 Apr 2022, 17:24
Fri, 8 Apr 2022, 15:46	Fri, 8 Apr 2022, 21:42
Fri, 8 Apr 2022, 18:55	Sat, 9 Apr 2022, 02:35
Sat, 9 Apr 2022, 05:15	Sat, 9 Apr 2022, 11:22
Sat, 9 Apr 2022, 09:35	Sat, 9 Apr 2022, 14:50
Sun, 10 Apr 2022, 01:30	Sun, 10 Apr 2022, 08:56
Sun, 10 Apr 2022, 12:05	Sun, 10 Apr 2022, 19:34
Mon, 11 Apr 2022, 00:15	Mon, 11 Apr 2022, 06:26
Mon, 11 Apr 2022, 05:55	Mon, 11 Apr 2022, 10:28
Mon, 11 Apr 2022, 19:05	Tue, 12 Apr 2022, 00:20
Mon, 11 Apr 2022, 22:45	Tue, 12 Apr 2022, 08:58
Tue, 12 Apr 2022, 09:45	Tue, 12 Apr 2022, 14:50
Tue, 12 Apr 2022, 15:15	Wed, 13 Apr 2022, 00:02
Tue, 12 Apr 2022, 18:55	Wed, 13 Apr 2022, 01:40
Wed, 13 Apr 2022, 01:25	Wed, 13 Apr 2022, 07:50
Wed, 13 Apr 2022, 09:35	Wed, 13 Apr 2022, 15:16
Wed, 13 Apr 2022, 12:25	Wed, 13 Apr 2022, 19:55
Wed, 13 Apr 2022, 17:35	Thu, 14 Apr 2022, 00:08
Thu, 14 Apr 2022, 20:55	Fri, 15 Apr 2022, 02:41
Fri, 15 Apr 2022, 02:16	Fri, 15 Apr 2022, 07:14
Fri, 15 Apr 2022, 08:15	Fri, 15 Apr 2022, 13:36
Fri, 15 Apr 2022, 12:55	Fri, 15 Apr 2022, 18:15
Fri, 15 Apr 2022, 18:45	Fri, 15 Apr 2022, 23:30
Sat, 16 Apr 2022, 00:15	Sat, 16 Apr 2022, 05:02
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APPENDIX D

MOUNT PLEASANT OPERATION – 2022 ANNUAL AIR QUALITY REVIEW

TODOROSKI AIR SCIENCES
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7 March 2023

Mariah Lane
Environmental Advisor
MACH Energy Australia
Via email: Mariah.Lane@machenergy.com.au

RE: Mount Pleasant Operation – 2022 Annual Air Quality Review

Dear Mariah,
Todoroski Air Sciences have conducted a review and analysis of the annual average deposited dust, TSP, PM_{10} and $PM_{2.5}$ levels recorded at Mount Pleasant Operation (MPO) in 2022.

Annual air quality criteria

As per consent DA 92/97 Schedule 3 Condition 20 "*Except for the air-affected land referred to in Table 1, the Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not exceed the criteria listed in Tables 8, 9 or 10 at any residence on privately-owned land.*" The criteria from Tables 8 to 10 are set out below:

Table 8: Long term criteria for particulate matter

Pollutant	Averaging period	[d]Criterion
Total suspended particulate (TSP) matter	Annual	[a]90 µg/m³
Particulate matter < 10 µm (PM_{10})	Annual	[a]25 µg/m³
Particulate matter < 2.5 µm ($PM_{2.5}$)	Annual	[a]8 µg/m³

Table 9: Short term criteria for particulate matter

Pollutant	Averaging period	[d]Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	[b]50 µg/m³
Particulate matter < 2.5 µm ($PM_{2.5}$)	24 hour	[b]25 µg/m³

Table 10: Long term criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c] Deposited dust	Annual	[b]2 g/m²/month	[a]4 g/m²/month

Notes to Tables 8-10:
[a] *Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources)*
[a] *Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to other sources)*
[b] *Incremental impact (i.e. incremental increase in concentrations due to the development on its own)*
[c] *Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method*
[d] *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed to by the Secretary.*

When the measured cumulative annual average deposited dust level at compliance monitors is below the criterion of 4g/m^2/month in Table 10, it is inferred that compliance is achieved. If this criterion is exceeded, the applicant must demonstrate compliance with the maximum increase in the deposited dust level of 2g/m^2/month.

Dust Deposition

This review has analysed dust deposition data recorded at the MPO monitors for the 2022 year.

Figure 1 presents a plan of the dust gauge monitoring locations for both compliance and non-compliance monitors in the area around MPO and the annual average deposited dust levels. The figure includes annual windrose plots of the meteorological data collected at the M-WM1, M-WM2, M-WS4 and M-WM5 stations during 2022. In general, winds were predominately from the southeast and northwest quadrants.

Table 1 summarises the MPO dust deposition monitoring data for the 2022 period.

The D7 monitor recorded a level above 4g/m^2/month, however per the MPO Air Quality and Greenhouse Gas Management Plan (**MACH Energy, 2019**), D7 is not used to assess compliance against the deposited dust criteria as the monitor is located in close proximity to the northern boundary of a neighbouring mining operation open cut pit, and there are no privately-owned receivers in the vicinity of this monitoring location.

The data indicate that the annual average deposited dust levels measured at the MPO monitors representative of residences on privately-owned land were below the cumulative criterion of 4g/m^2/month in 2022, and as such it is considered that compliance with the relevant criterion in Table 10 of DA 92/97 Schedule 3 Condition 20 has been achieved.

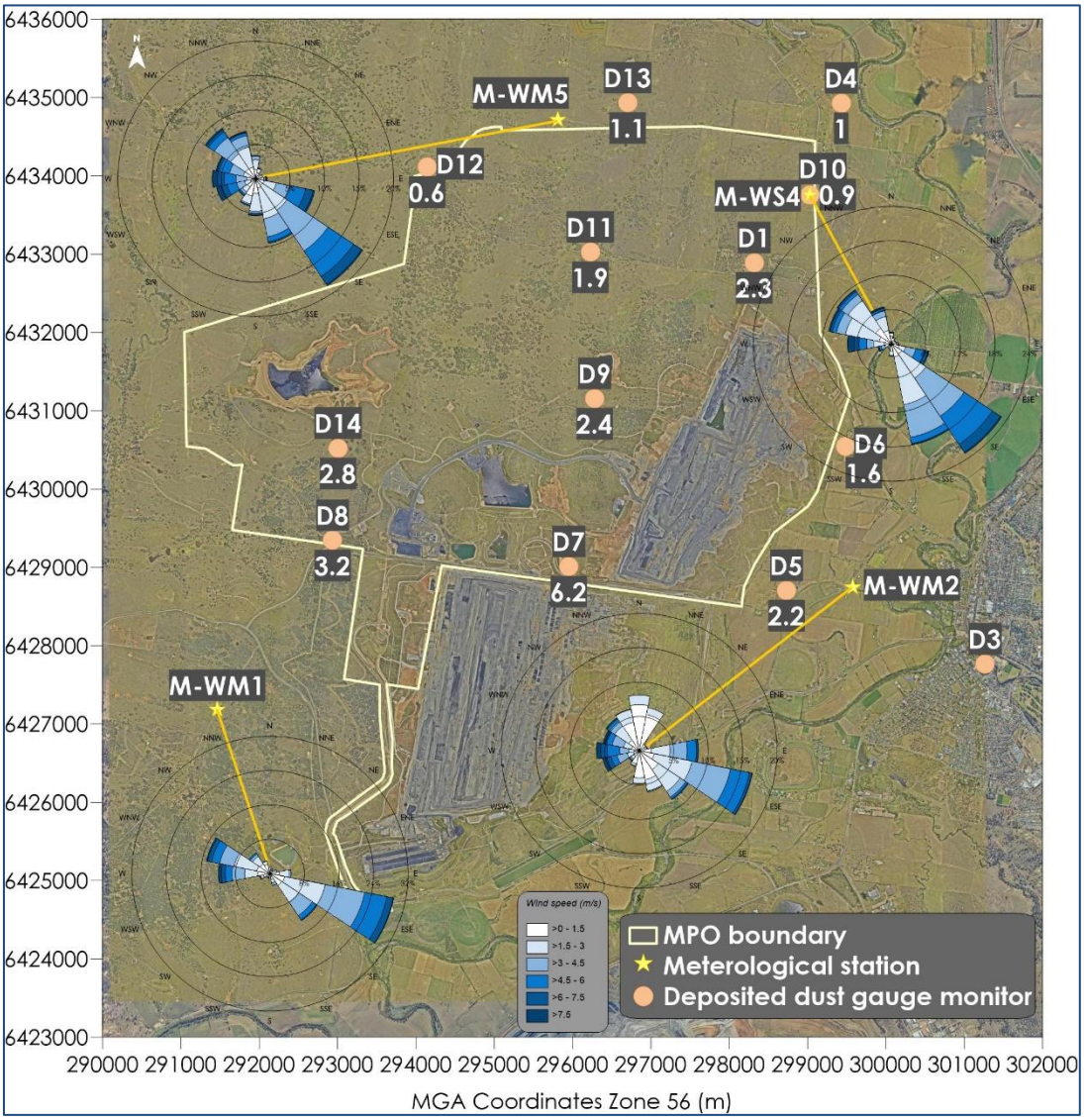

Figure 1: Annual average deposited dust results for 2022

Table 1: Deposited dust monthly average compliance monitoring data for 2022 (g/m²/month)

Date	D1	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14
Jan	1.8	1.7	1.6	4.7	1.2	5.1	3.9	3.2	1.0	2.9	0.7	1.4	2.9
Feb	4.5	-	1.6	3.0	1.7	12.8c	5.5	3.1	1.4	3.9	1.0	2.0	5.3
Mar	1.7	-	1.0	1.7	1.3	14.3c	4.4	1.8	0.6	2.1	1.1	1.1	4.1
Apr	3.1	-	1.0	1.9	1.8	17.4c	4.3	1.8	1.2	1.7	0.9	1.2	4.8
May	2.1	-	1.0	1.6	1.6	5.4	2.4	1.8	1.8	1.2	0.4	0.9	2.9
Jun	1.8	-	0.4	1.3	1.3	2.4	2.0	1.0	0.4	0.8	0.3	0.7	1.1
Jul	2.2	-	0.5	1.7	1.4	12.4	1.8	1.4	0.6	0.9	0.3	0.8	1.8
Aug	2.3	-	0.7	1.6	1.2	12.1	1.9	1.6	0.7	0.8	0.3	0.5	1.1
Sep	1.2	-	1.1	1.8	1.4	1.4	3.0	2.1	0.5	1.1	0.5	0.7	2.4
Oct	2.0	-	1.1	1.8	1.1	6.4	3.1	2.9	1.2	2.0	0.3	1.2	2.3
Nov	2.1	-	1.1	3.4	2.1	4.7	3.4	3.0	0.8	2.1	0.6	1.1	2.4
Dec	2.2	-	0.8	2.0	3.1	47.5c	2.4	4.6	0.9	3.0	0.7	1.8	2.9
Annual average	2.3	*	1.0	2.2	1.6	6.2	3.2	2.4	0.9	1.9	0.6	1.1	2.8

– no access, construction site * Insufficient data for annual average calculation c – contaminated

Annual Average TSP

This review has analysed the TSP monitoring data recorded at the MPO High Volume Air Sampler (HVAS) monitors in 2022.

Figure 2 presents the 24-hour average TSP levels for 2022.

Table 2 presents a summary of the annual average TSP monitoring data for the area around MPO in 2022.

Figure 3 presents a plan of the HVAS monitoring locations in the area around MPO and the annual average TSP levels. The figure includes annual windrose plots of the meteorological data collected at the M-WM1, M-WM2, M-WS4 and M-WM5 stations during 2022.

The data show that the annual average TSP levels for all the MPO HVAS monitors are below the relevant criterion of 90µg/m³. As such, it is considered that compliance with the relevant criterion in Table 8 of DA 92/97 Schedule 3 Condition 20 is achieved.

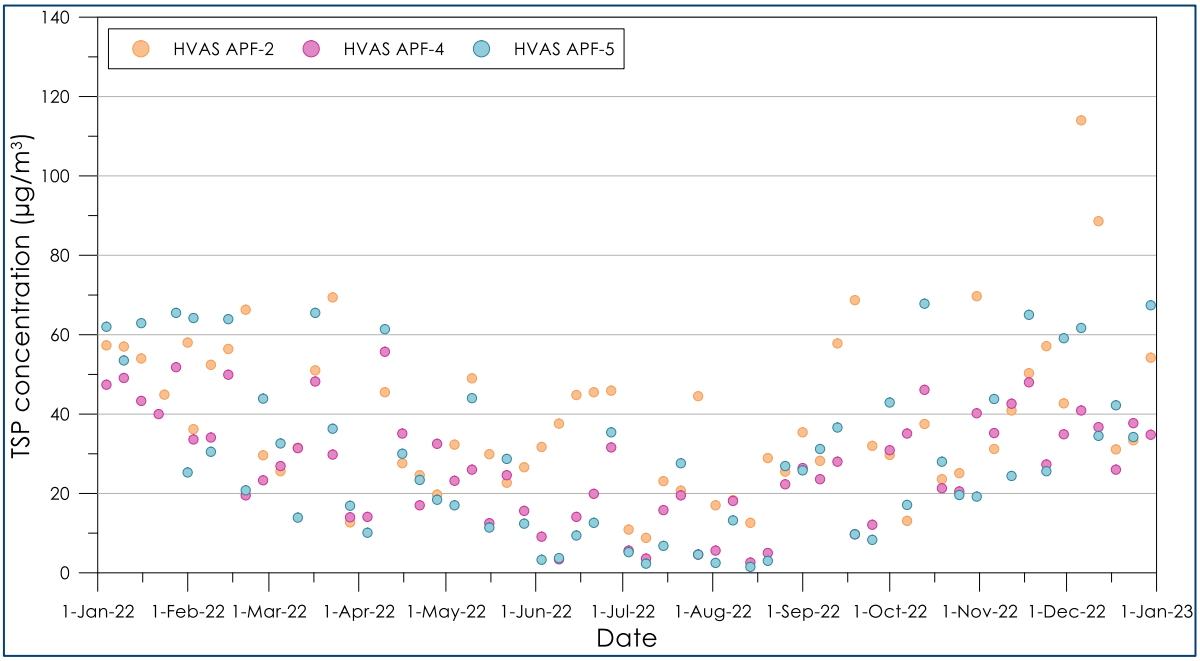

Figure 2: 24-hour average TSP HVAS records for 2022

Table 2: Annual average TSP monitoring data for 2022

Location	Annual average TSP level - all days (µg/m³)
HVAS APF-2	39.3
HVAS APF-4	26.8
HVAS APF-5	30.1

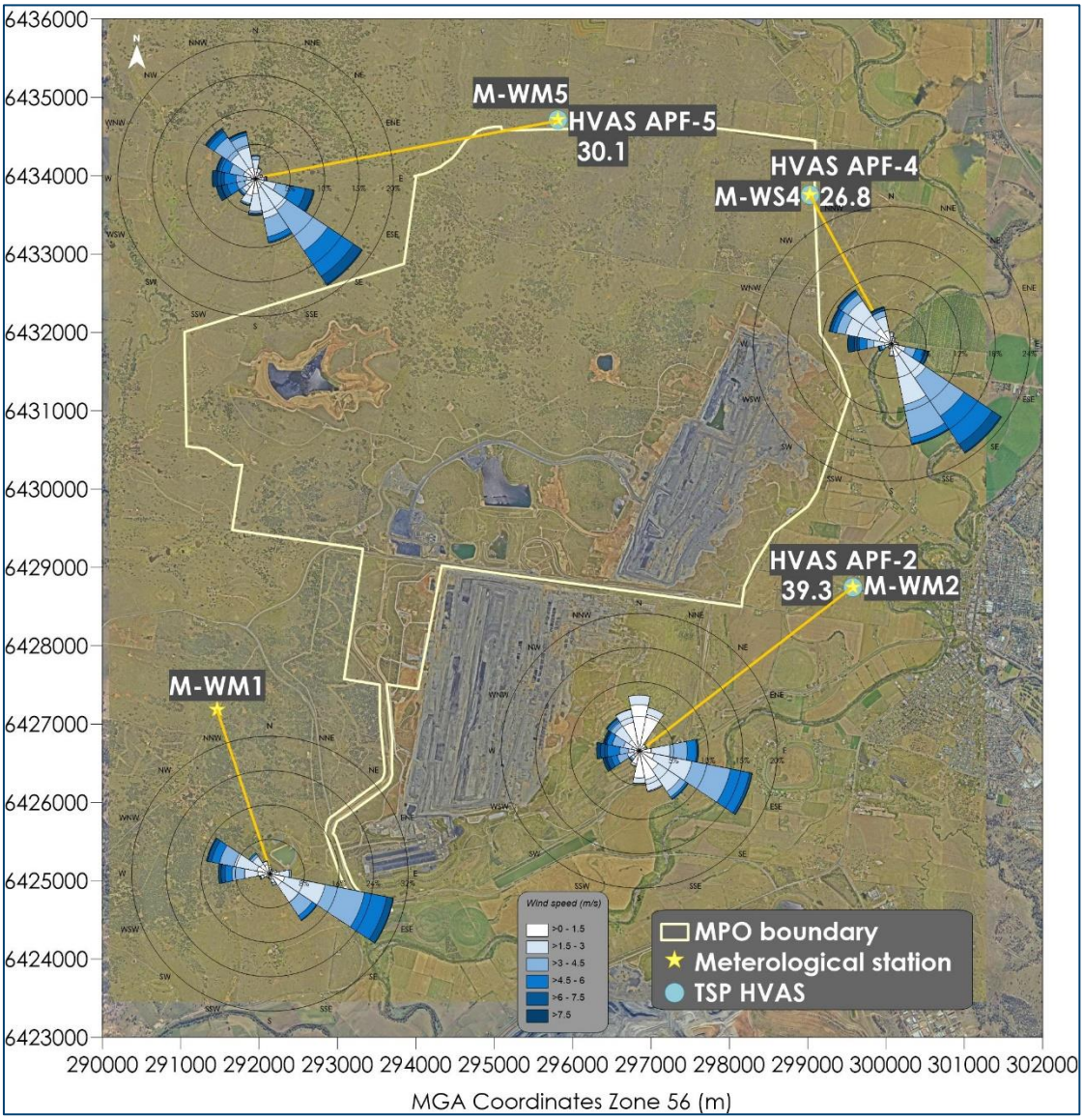

Figure 3: Annual average TSP results for 2022

Annual Average PM_{10}

This review has analysed the annual average PM_{10} monitoring data recorded at the MPO Palas Fidas monitors in 2022.

It is noted that there was insufficient data (less than 75%) to calculate a valid annual average PM_{10} level at the APF-5 monitor in 2022 due to power issues and a rodent infestation however for the purpose of this review an average of the available data has been presented.

Table 3 includes a summary of the annual average PM_{10} monitoring data for the area around MPO in 2022.

Figure 4 presents a plan of the monitoring locations in the area around MPO and the measured annual average PM_{10} levels.

The annual average PM_{10} levels at the MPO Palas Fidas and DPE monitors were below the relevant criterion of 25µg/m³ in 2022 and as such, it is considered that compliance with the relevant criterion in Table 8 of DA 92/97 Schedule 3 Condition 20 has been achieved.

Table 3: Annual average PM_{10} monitoring data for 2022

Location	Annual average PM_{10} (µg/m³)
APF-2	14.4
APF-4	10.8
APF-5	12.4*
Muswellbrook	16.6
Muswellbrook NW	14.3

*Insufficient data (51% data availability) for an annual average calculation

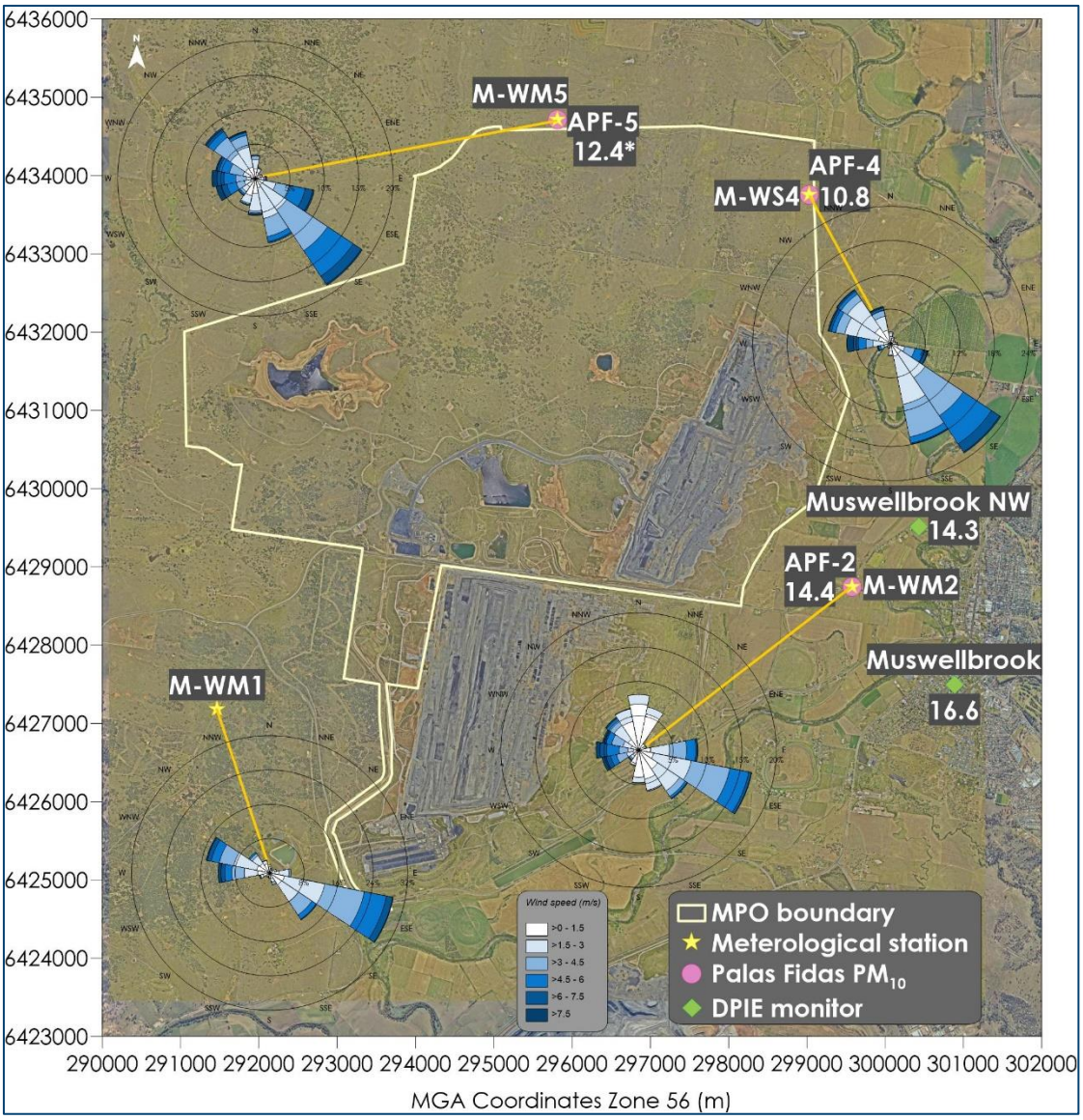

Figure 4: Annual average PM_{10} results for 2022

24-hour Average PM_{10}

This review has analysed the 24-hour average PM_{10} monitoring data recorded at the MPO Palas Fidas monitors in 2022.

Figure 5 presents the 24-hour average PM_{10} levels around MPO for 2022. As noted above, there is a gap in the available APF-5 data in 2022 due to power issues and a rodent infestation.

Table 4 includes a summary of the 24-hour average PM_{10} monitoring data for the area around MPO in 2022.

The data indicate that the 24-hour average PM_{10} levels were generally low throughout 2022. There were two days at the APF-2 and one day at the DPE Muswellbrook NW monitors with 24-hour average PM_{10} levels above 50µg/m^3 in 2022.

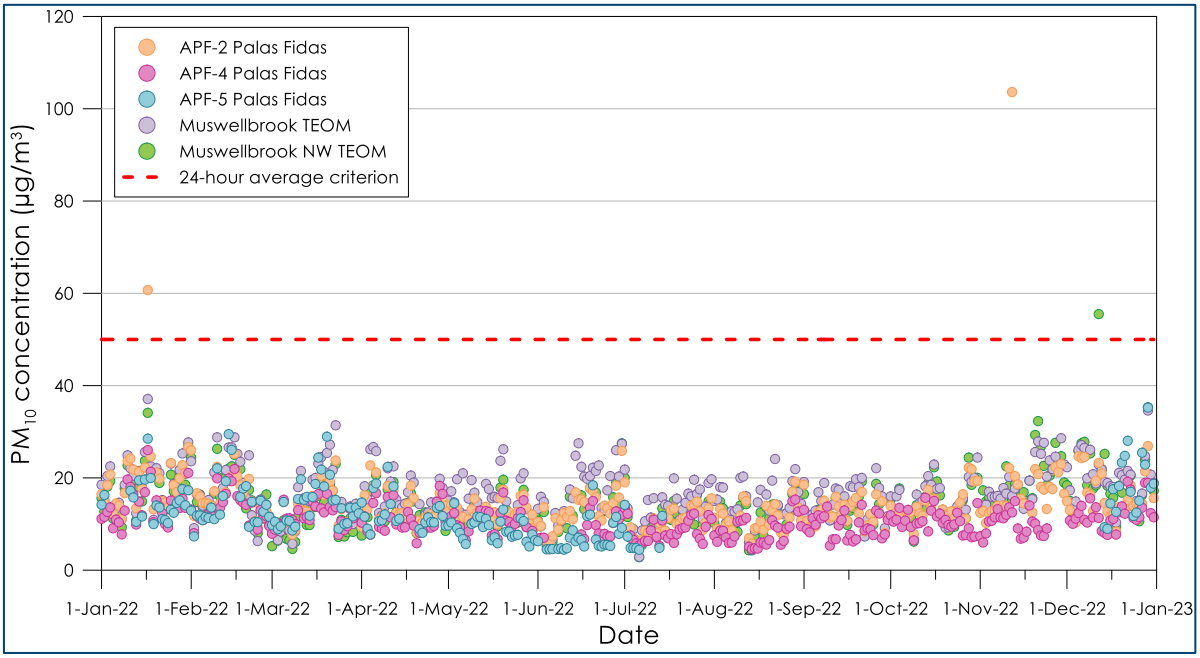

Figure 5: 24-hour average PM_{10} records for 2022

Table 4: 24-hour average PM_{10} monitoring data for 2022

Location	Maximum 24-hour PM_{10} (µg/m^3)	Number of 24-hour PM_{10} levels above criterion (50µg/m^3)
APF-2	103.6	2
APF-4	26.0	0
APF-5	35.2	0
Muswellbrook	37.1	0
Muswellbrook NW	55.5	1

The following section looks at the elevated PM_{10} levels recorded at the APF-2 monitor on 17 January 2022 and 12 November 2022 and to the DPE Muswellbrook NW on 12 December 2022 in further detail.

17 January 2022

The APF-2 monitor recorded a 24-hour average PM_{10} level of 60.7µg/m^3 on 17 January 2022. APF-2 was not downwind (i.e. downwind 0% of the time) of MPO on this day and therefore MPO could not have contributed to the elevated level recorded on 17 January 2022.

12 November 2022

On 12 November 2022, the APF-2, monitor recorded a 24-hour average PM_{10} level of 103.6µg/m^3. The APF-2 monitor was downwind of MPO approximately 17% of the time on this day.

The contribution from MPO to the APF-2 monitor was determined to be the total level recorded at APF-2 at the times in which the monitor would have been downwind of the mine minus the background concentration (taken to be the level at APF-4) (i.e. contribution = downwind level – upwind level).

Based on this analysis the estimated maximum contribution from MPO at APF-2 was less than or equal to 1.5µg/m^3 on 12 November 2022.

12 December 2022

The Muswellbrook NW monitor recorded a 24-hour average PM_{10} level of 55.5µg/m^3 on 12 December 2022. The Muswellbrook NW monitor was downwind of MPO approximately 54% of the time on this day.

There was a spike of 451.1µg/m^3 in the 1-hour average levels at 11:00pm. The wind direction data from Muswellbrook NW indicate that the monitor would have been downwind of MPO at this time.

It is understood that MPO corresponded with the DPE regarding this elevated reading and it was confirmed that the readings were legitimate however no direct cause of the elevated reading was found. On this basis it cannot be certain that MPO was the cause of the elevated reading. However as the reading appears to be valid and MPO was upwind of the Muswellbrook NW monitor at the time but was not upwind of the intermediate APF2 monitor, we have calculated the theoretical contribution from MPO.

The contribution from MPO to the Muswellbrook NW monitor was determined to be the total level recorded at Muswellbrook NW at the times in which the monitor would have been downwind of the mine minus the background concentration (taken to be the level at APF-4) (i.e. contribution = downwind level – upwind level).

Based on this analysis the estimated maximum contribution from MPO at Muswellbrook NW was less than or equal to 40.2µg/m^3 on 12 December 2022.

Summary of investigations

Table 5 presents a summary of MPO's estimated maximum contributions to the 24-hour averages recorded at the APF-2 monitor on 17 January 2022 and 12 November 2022 and to the DPE Muswellbrook NW on 12 December 2022.

Table 5: Estimated maximum potential contribution of MPO to the elevated PM_{10} levels

Date	Monitor	Recorded 24-hour average PM_{10} level (µg/m^3)	Percentage of time downwind	Estimated maximum contribution to 24-hour average PM_{10} level (µg/m^3)
17 January 2022	APF-2	60.7	0%	0.0
12 November 2022	APF-2	103.6	17%	1.5
12 December 2022	Muswellbrook NW	55.5	72%	40.2

For each of the elevated 24-hour average PM_{10} levels in the MPO monitoring network in 2022, the estimated incremental contribution from MPO was less than 50g/m^3. MPO is therefore considered compliant with DA 92/97 Schedule 3 Condition 20 Table 9.

Annual Average $PM_{2.5}$

This review has analysed the annual average $PM_{2.5}$ monitoring data recorded at the MPO Palas Fidas monitors in 2022.

It is noted that there was insufficient data (less than 75%) to calculate a valid annual average $PM_{2.5}$ level at the APF-5 monitor in 2022 due to power issues and a rodent infestation however for the purpose of this review an average of the available data has been presented.

Table 6 includes a summary of the annual average $PM_{2.5}$ monitoring data for the area around MPO in 2022.

Figure 6 presents a plan of the monitoring locations in the area around MPO and the measured annual average $PM_{2.5}$ levels.

The annual average $PM_{2.5}$ levels at the MPO Palas Fidas and DPE monitors were below the relevant criterion of 8µg/m³ in 2022 and as such it is considered that compliance with the relevant criterion in Table 8 of DA 92/97 Schedule 3 Condition 20 has been achieved.

Table 6: Annual average $PM_{2.5}$ monitoring data for 2022

Location	Annual average $PM_{2.5}$ (µg/m³)
APF-2	4.8
APF-4	4.3
APF-5	4.6*
Muswellbrook	6.2

*Insufficient data (42% data availability) for an annual average calculation

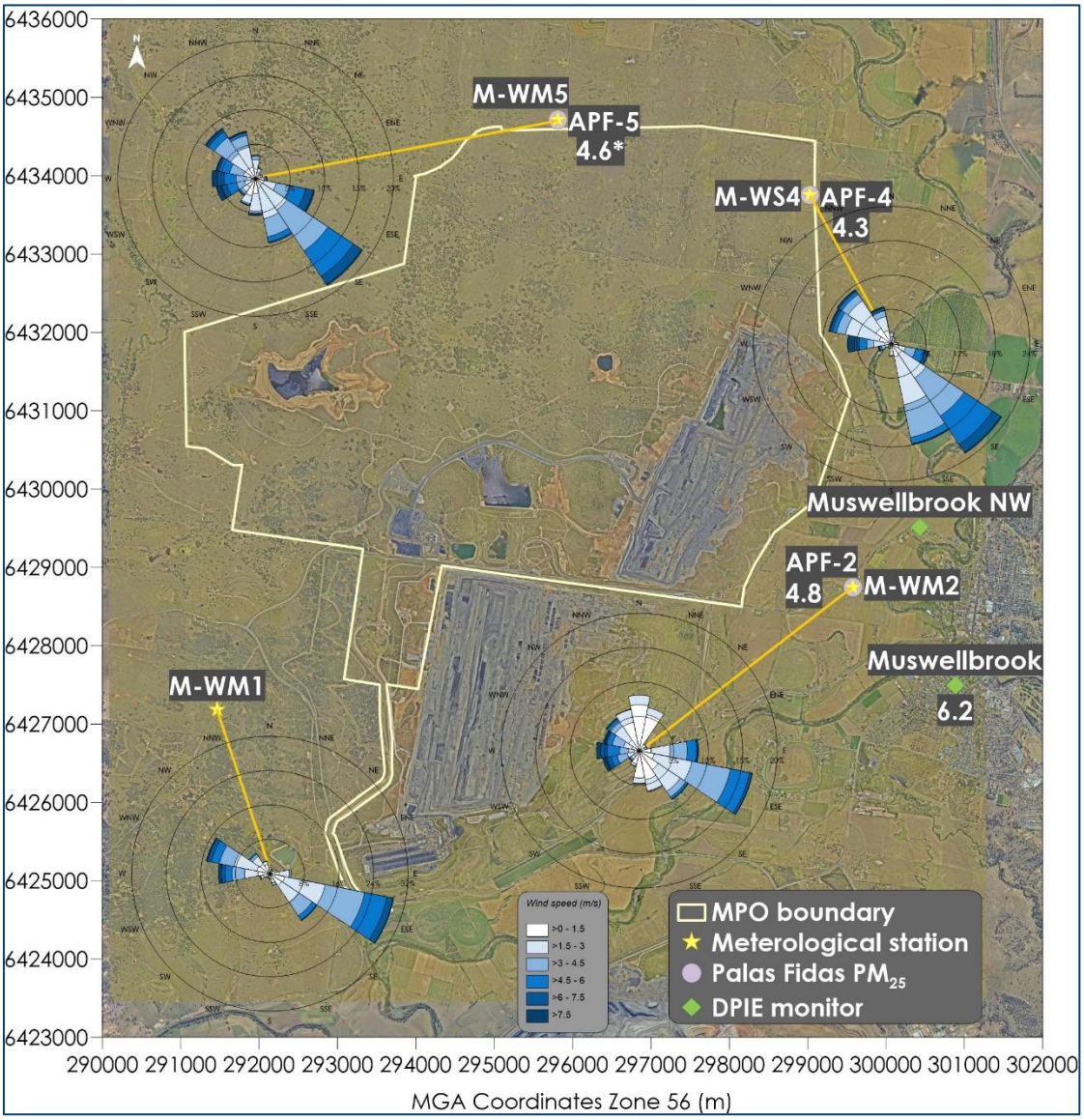

Figure 6: Annual average $PM_{2.5}$ results for 2022

24-hour Average $PM_{2.5}$

This review has analysed the 24-hour average $PM_{2.5}$ monitoring data recorded at the MPO Palas Fidas monitors in 2022.

Figure 7 presents the 24-hour average $PM_{2.5}$ levels around MPO for 2022. As noted above, there is a gap in the available APF-5 data in 2022 due to power issues and a rodent infestation.

The DPE Muswellbrook monitor recorded significantly higher levels than the Palas Fidas monitors in winter, likely due to domestic wood heater smoke near the monitor.

Table 7 includes a summary of the 24-hour average $PM_{2.5}$ monitoring data for the area around MPO in 2022. The maximum 24-hour average $PM_{2.5}$ concentrations at the MPO and DPE monitors were below 25µg/m^3 in 2022, and thus it is considered that compliance with the relevant criterion in Table 9 of DA 92/97 Schedule 3 Condition 20 is achieved.

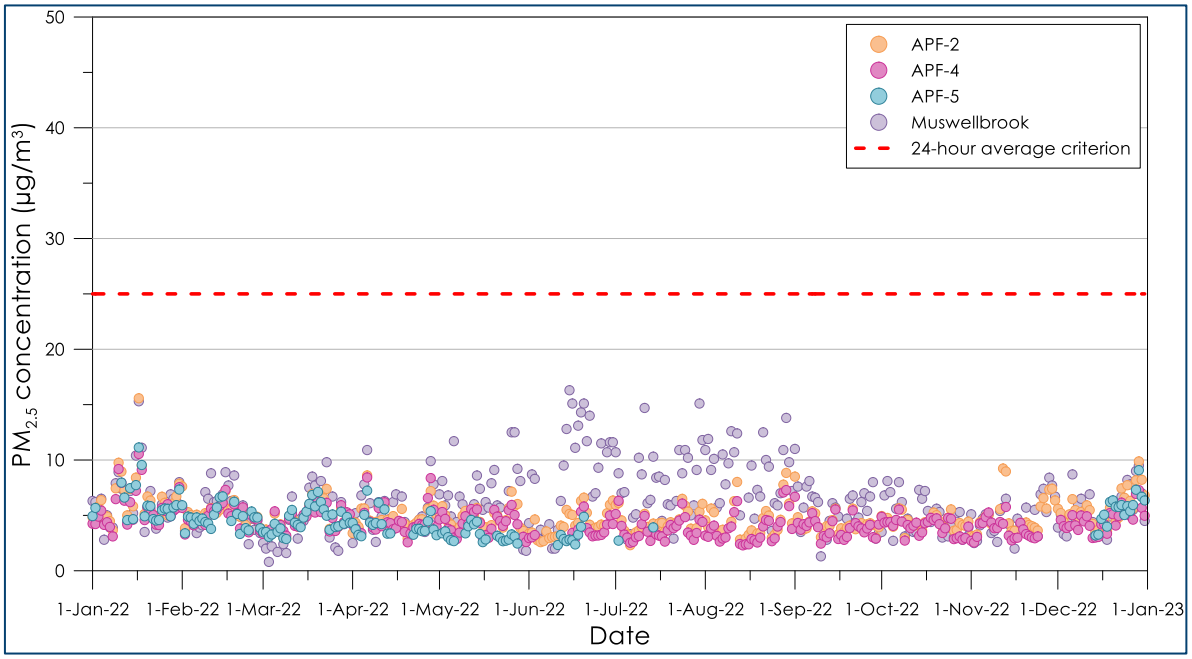

Figure 7: 24-hour average $PM_{2.5}$ records for 2022

Table 7: 24-hour average $PM_{2.5}$ monitoring data for 2022

Location	Maximum 24-hour $PM_{2.5}$ (µg/m³)	Number of 24-hour $PM_{2.5}$ levels above criterion (25µg/m³)
APF-2	15.6	0
APF-4	10.5	0
APF-5	11.1	0
Muswellbrook	16.3	0

Conclusions

This report has analysed the deposited dust, TSP, PM_{10} and $PM_{2.5}$ monitoring data recorded at MPO in 2022.

The analysis shows that the annual averages were below the relevant criteria in 2022 and therefore MPO is considered to be compliant with the annual air quality criteria per DA 92/97 Schedule 3 Condition 20.

There were a three elevated 24-hour average PM_{10} levels recorded across the MPO monitoring network in 2022. The estimated contribution from MPO on these occasions was found to be less than 50µg/m³. All 24-hour average $PM_{2.5}$ levels recorded across the MPO monitoring network in 2022 were below the 25µg/m³ criterion. Therefore compliance with the 24-hour average criterion for PM_{10} was achieved as per Table 9 in DA 92/97 Schedule 3 Condition 20 in 2022.

Please feel free to contact us in relation to any aspect of this analysis.

Yours faithfully,
Todoroski Air Sciences

Katie Trahair

Dan Kjellberg

References

MACH Energy (2019)

"Mount Pleasant Operation Air Quality and Greenhouse Gas Management Plan", MACH Energy Australia Pty Ltd, May 2019.