MACHEnergy

Mount Pleasant Operation

Monthly Environmental Monitoring Report

December 2023

1. Introduction

The Mount Pleasant Operation (MPO) is located within Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*) and the MPO Development Approval (DA 92/97).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97
Reporting Period Start Date	1 December 2023
Reporting Period End Date	31 December 2023
Date All Data Received	20 February 2024

Links to two key regulatory documents are provided here:

- MACH Energy Environment Protection Licence EPL 20850; and
- Mount Pleasant Operation Development Application Approval DA 92/97.

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Palas Fidas Air Quality Monitoring sites.
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with *MPO Environmental Monitoring Program* (*EMP*) and Project Approval (DA 92/97).

All monitoring is undertaken by suitably qualified and experienced person(s).

The MPO Environmental Monitoring Network is shown in the following figures**:**

- **Figure 2-1** shows MPO attended noise monitoring locations and Noise Assessment Groups (NAGs).
- **Figure 2-2** shows the MPO Air Quality Monitoring network.
- **Figure 2-3** shows the MPO Blast Monitoring Locations.
- **Figure 2-4** shows the MPO Groundwater Monitoring network; and
- **Figure 2-5** shows the MPO Surface Water Monitoring network.

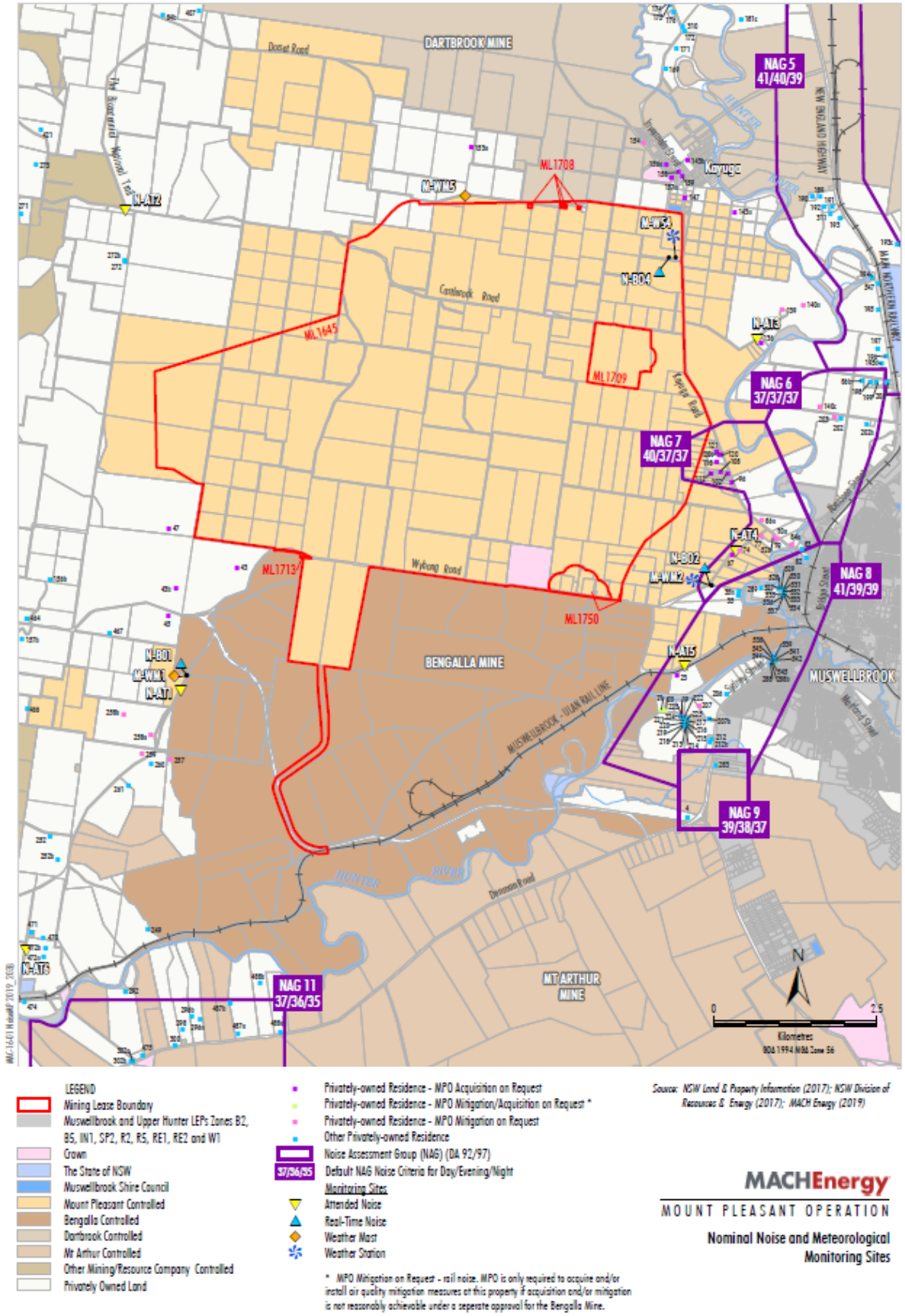


Figure 2-1 – MPO Attended Noise Monitoring Assessment Groups and Locations

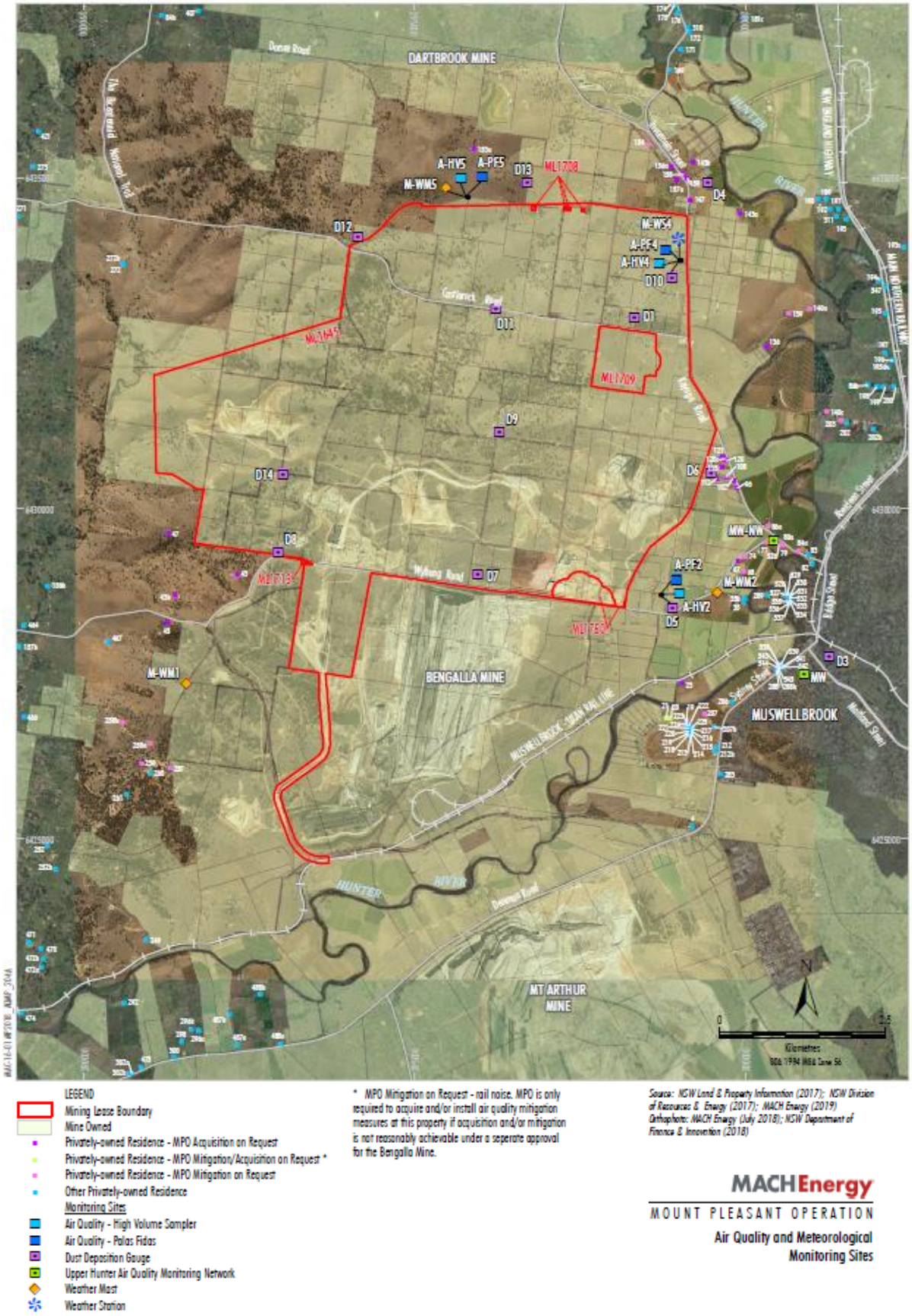
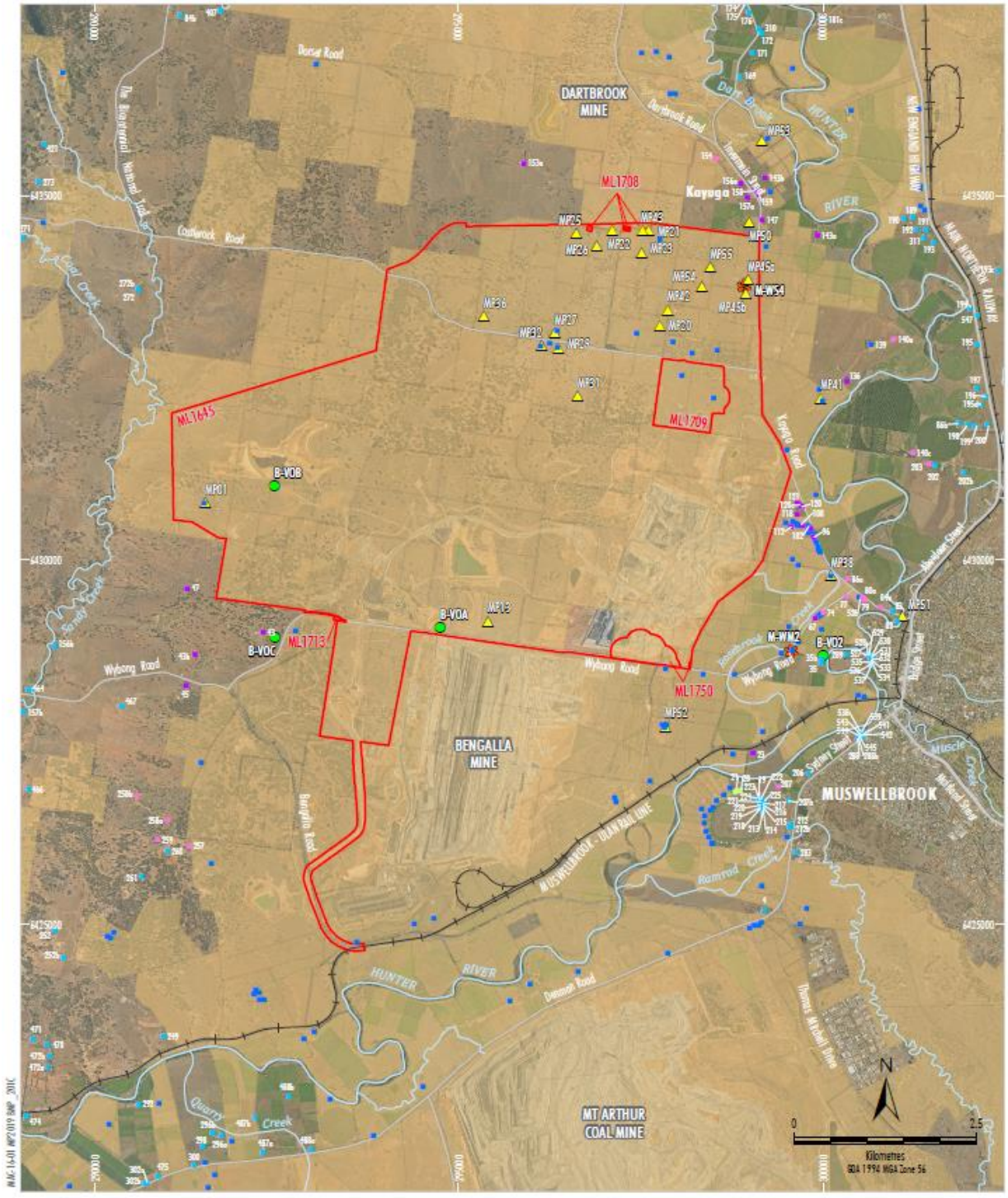


Figure 2-2 – MPO Air Quality and Meteorological Monitoring Network



LEGEND

- Mining Lease Boundary
- Mine-owned Land
- Mine-owned Dwelling
- Privately-owned Residence - MPO Acquisition on Request
- Privately-owned Residence - MPO Mitigation/Acquisition on Request *
- Privately-owned Residence - MPO Mitigation on Request
- Other Privately-owned Residence
- Blast Monitoring Site (Vibration/Overpressure)
- Weather Station
- Historic Heritage Site Subject to Blast Criteria

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

Source: MACH Energy (2020); NSW Spatial Services (2019)
Orthophoto: MACH Energy (Jan 2020)

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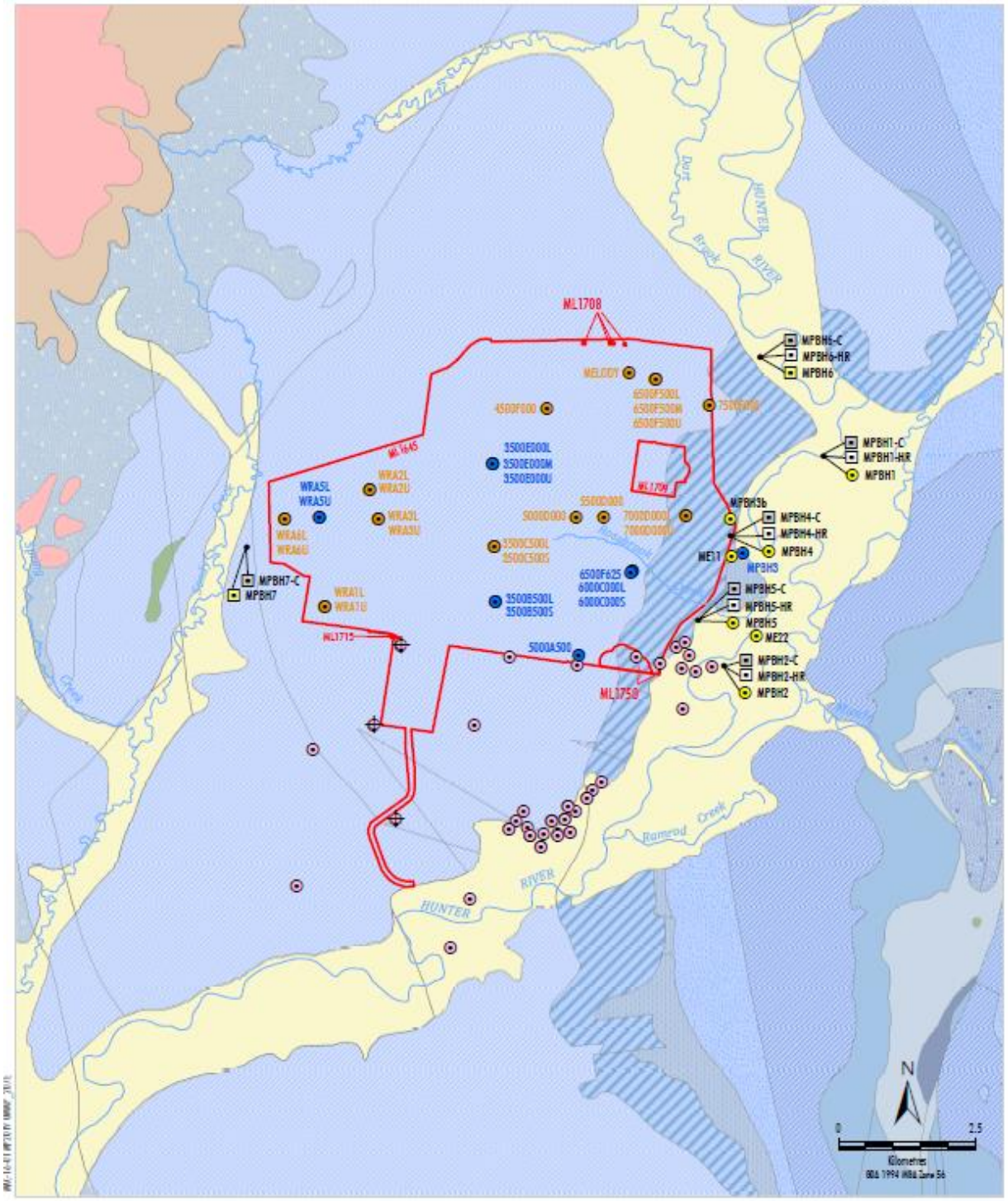
MOUNT PLEASANT OPERATION
Blast Monitoring Locations

Figure 2-3 – MPO Blast Monitoring Locations



LEGEND

Mining Lease Boundary

Mount Pleasant Monitoring

- Standpipe
- Standpipe - Alluvium
- Standpipe - Historical

Planned Mount Pleasant Monitoring

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

Bengalla Monitoring

- Standpipe
- Vibrating Wire Piezometer

Source: NSW Land & Property Information (2019); NSW Division of Resources & Energy (2019); MACH Energy (2019)

Note: Refer Figure 3 for geology legend

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Augmentations to the Groundwater Monitoring Network

Figure 2-4 – MPO Groundwater Monitoring Network

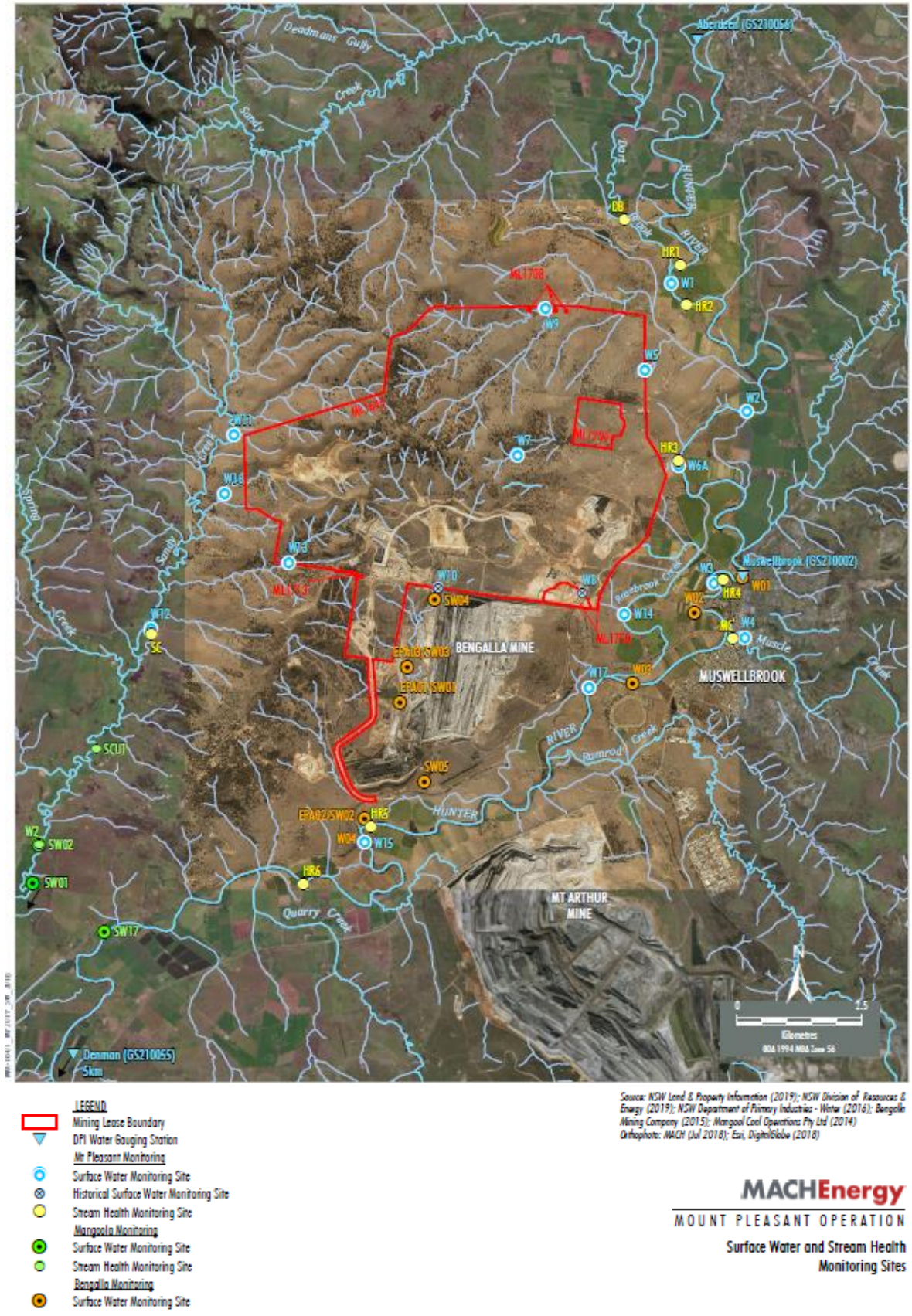

Figure 2-5 – MPO Surface Water Monitoring Network

3. Meteorological Monitoring

Weather data is measured continuously at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (PM_{10} and $PM_{2.5}$), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall and atmospheric pressure.

Most meteorological data was captured at M-WS2 (>86.1%) during December 2023 (the monitoring period) except for particulate matter less than 10 µm (PM10) and particulate matter less than 2.5 µm (PM2.5)(56.9%). Majority of this data was collected at M-WS4 (99.8%).

Throughout December 2023, there was 98.4mm and 109.8mm of rainfall recorded at M-WS2 and M-WS4, respectively.

4. Dust Depositional Monitoring

4.1 Methodology

Dust deposition was monitored according to the OEH's *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (DECC 2007), which references *Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method*. The dust deposition monitoring network comprises of 13 dust deposition gauges (DDG). Details of the monitoring locations are shown in **Figure 2-2**.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

4.2 Results

The dust deposition exposure period for gauges commenced on 27 November 2023. Sample collection was undertaken on 27 December 2023 by AECOM with sample analysis performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory. Results are summarised in **Table 4-1**. Annual rolling averages for December 2023 have been provided as an indication of performance between December 2022 – December 2023 and does not represent annual average results for 2023 as per Schedule 3, Condition 20 of DA 92/97.

Table 4-1: Dust Depositional Results – December 2023

Location	YTD Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	1.4	1.9
D3	2.1	2.0
D4	1.4	1.3
D5a	1.6	2.8
D6	2.1	2.5
D7b	17.2	**8.0**
D8	1.7	3.8
D9a	2.1	**4.2**
D10	1.7	1.1
D11	2.2	3.0
D12	0.8	1.0
D13	1.3	1.4
D14	1.6	3.7
Criterion	-	**4**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*

Contaminated results, as described in Section 4.1, are not included in the 12-month rolling average. Site D7b is located within close proximity to the northern boundary of a neighbouring mining operation and thus can be influenced by this site. D7b will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area. Furthermore, there are no privately-owned receivers in the vicinity of D8, D9 and D14. Whilst these sites do not represent residence(s) on privately-owned land, they will continue to be monitored in accordance with the *MPO Air Quality and Greenhouse Gas Management Plan* (MACH Energy, 2019).

Field notes from the December sampling event noted that all the gauges contained insects, five contained vegetation and three contained bird droppings. Field notes indicated that gauge D7b had a surface sheen on the water in the dust gauge. Contents were light brown in colour, slightly turbid and had bird droppings. D7b was deemed contaminated. Gauge 9a was noted to be clear in colour and no turbidity. The insoluble solids result for site D7b was not included in the annual average calculation. All other December 2023 insoluble solid

results were included in the annual rolling average calculations. **Figure 4-1** compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

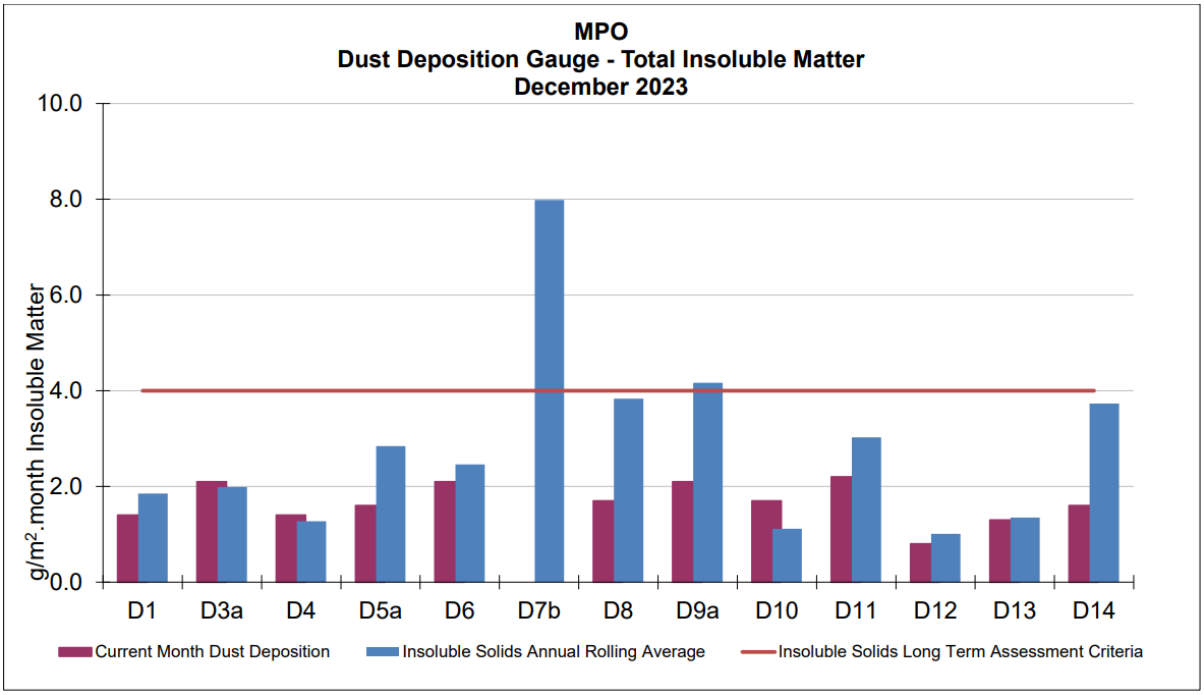

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average – December 2023

5. Total Suspended Particulates

All High-Volume Air Samplers (HVAS) are run for 24 hours every six days in accordance with *AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (DECC, 2007), referencing *AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method*, for the monitoring of TSP.

Three TSP HVAS units are included in the MPO air quality monitoring network and are displayed in **Table 5-1** below. These units were commissioned in March 2017.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.1 Assessment Criteria

TSP is assessed against the guidelines defined in the *EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2016) and Project Approval DA 92/97. The DA 92/97 specifies an annual average project contribution plus background criterion of 90 µg/m^3.

5.2 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in **Table 5-2**. Annual rolling averages for December 2023 have been provided as an indication of performance between December 2022 – December 2023 and do not represent annual average results for 2023 as per Schedule 3, Condition 20 of DA 92/97.

Table 5-2 Total Suspended Particulate Monitoring Data – December 2023

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
1/12/2023	-	91.9	53.5	15.4
7/12/2023	-	65.3	100	61.3
13/12/2023	-	120	68	59.3
19/12/2023	-	101	90.8	90.5
25/12/2023	-	51.8	--	23
31/12/2023	-	37.6	42.6	26.2
Monthly Mean	-	71.7	65.8	51.6
Annual Rolling Average	90	60	50	39

Results with "-- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)

5.3 Discussion

For the reporting period, the annual rolling average TSP data at all sites was below the annual average criterion of 90 µg/m^3.

6. Real Time Air Quality Monitoring

Continuous particulate matter less than 10 µm (PM_{10}) and particulate matter less than 2.5 µm ($PM_{2.5}$) monitoring was conducted by three Palas Fidas units (one utilised for management only) at MPO during this reporting period.

The EPA identification numbers 1 and 2 refer to Palas Fidas units installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third unit (A-PF4) is installed on Kayuga Road with data used for management purposes only.

Real time PM_{10} and $PM_{2.5}$ 12-month rolling averages for December 2023 have been provided in Section 6.2 and 6.4 respectively, as an indication of performance during 2023 as per Schedule 3, Condition 20 of DA 92/97.

6.1 PM_{10} Results – 24 Hour Rolling Average

In accordance with the DA 92/97 limit of 50 µg/m3 for the 24-hour daily average, there was one (1) elevated reading in December 2023. Real time PM_{10} 24 hour daily average results for December 2023 are presented in **Table 6-1.**

Table 6-1: MPO Palas Fidas PM_{10} Data – December 2023

Date	A-PF2/EPA ID 1	A-PF4	A-PF5/EPA ID 2	Muswellbrook NW*	A-PF2, A-PF4, A-PF5 24 Hour Average Limit (µg/m³)
	24-hour Average Result				
1/12/2023	-	7	-	27.3	50
2/12/2023	-	8	-	9.8	50
3/12/2023	-	10	-	17.4	50
4/12/2023	-	12	-	15.5	50
5/12/2023	-	19	-	20.3	50
6/12/2023	-	21	-	33.3	50
7/12/2023	-	29	-	34.4	50
8/12/2023	-	38	-	28.1	50
9/12/2023	-	31	-	38.2	50
10/12/2023	-	20	-	25.6	50
11/12/2023	-	34	-	38.3	50
12/12/2023	-	17	-	20.5	50
13/12/2023	-	25	-	33.0	50
14/12/2023	-	21	-	48.7	50
15/12/2023	35	25	-	38.8	50
16/12/2023	34	22	-	39.2	50
17/12/2023	25	21	-	33.4	50
18/12/2023	42	35	-	39.2	50
19/12/2023	56	42	-	**51.8**	50
20/12/2023	26	28	-	15.5	50
21/12/2023	11	10	-	11.1	50
22/12/2023	17	13	-	22.7	50
23/12/2023	22	16	-	19.3	50
24/12/2023	13	14	-	10.6	50
25/12/2023	17	16	-	12.4	50
26/12/2023	16	19	-	8.4	50
27/12/2023	16	15	-	11.1	50
28/12/2023	16	15	-	9.2	50
29/12/2023	18	13	-	7.0	50
30/12/2023	16	13	-	8.5	50
31/12/2023	15	11	-	8.4	50

Notes:
Results in bold indicate elevated readings during adverse weather conditions.
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
**New South Wales Air Quality Monitoring Network Muswellbrook Northwest Monitor*

Figure 6-1 below shows the results of real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites in December 2023.

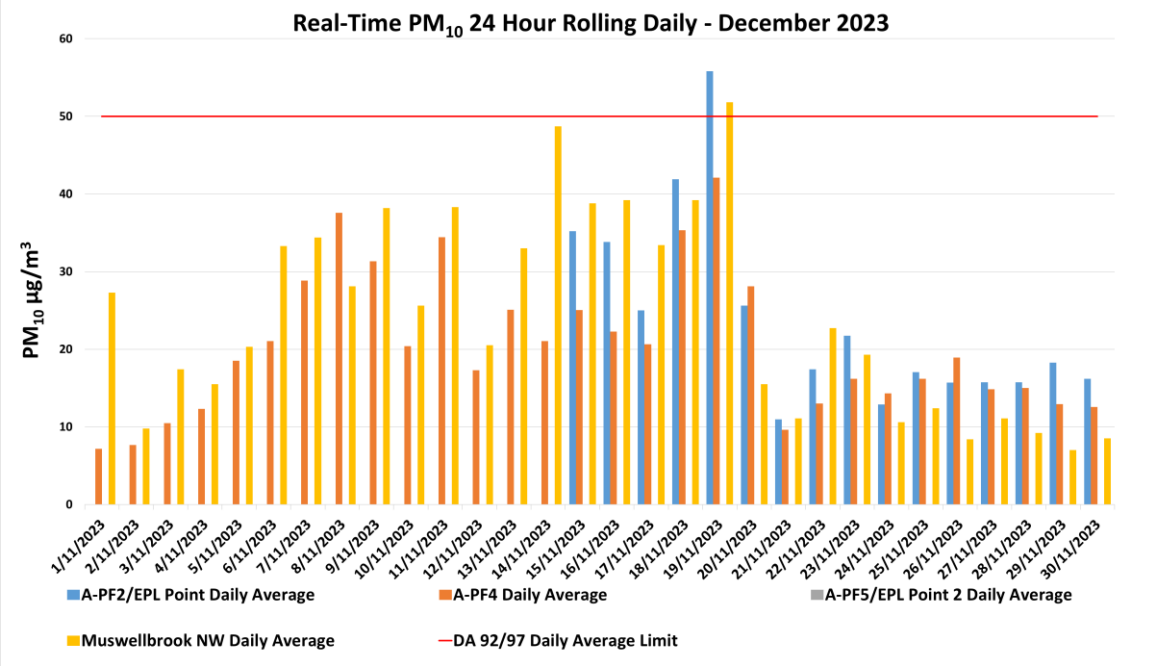

Figure 6-1: Real-time PM_{10} 24 Daily Average Results for December 2023.

6.2 PM_{10} Results – Annual Rolling Average

There was no exceedance of the PM_{10} annual rolling average reported at MPO during December 2023. Real time PM_{10} annual rolling averages during the reporting period are presented in **Figure 6-2** below.

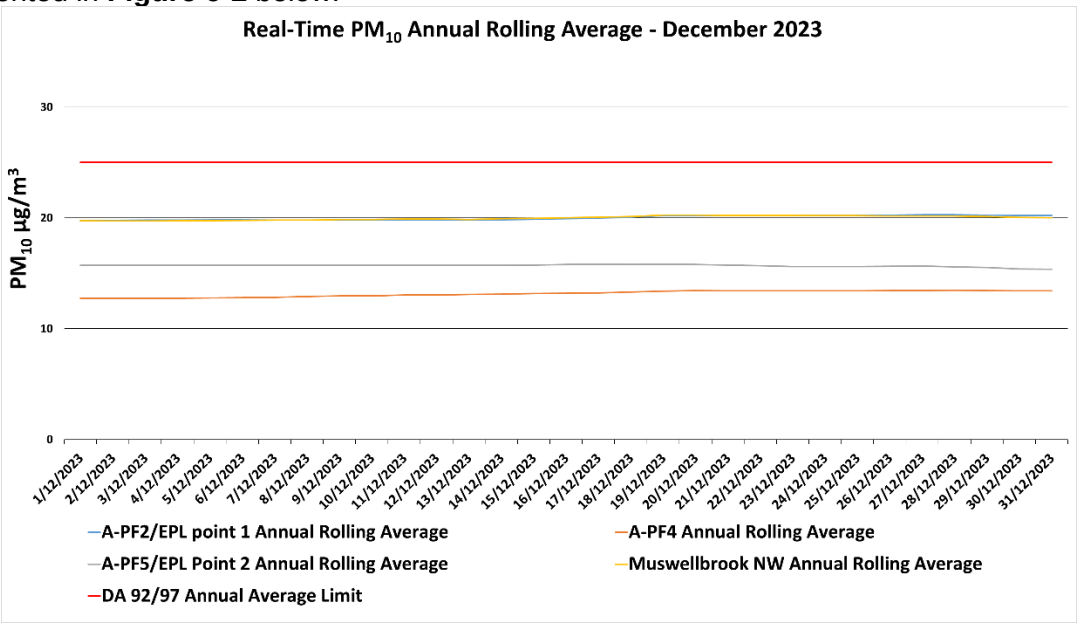

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for December 2023.

6.3 $PM_{2.5}$ Results – 24 Hour Daily Average

In accordance with the DA 92/97 limit of 25 µg/m3 for the 24-hour daily average, there was one (1) elevated reading in December 2023. Real time $PM_{2.5}$ 24 hour daily average results for December 2023 are presented in **Table 6-2.**

Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – December 2023

Date	A-PF2/EPA ID 1	A-PF4	A-PF5/EPA ID 2	A-PF2, A-PF4, A-PF5 24 Hour Average Limit (µg/m^3)
	24-hour Average Result			
1/12/2023	-	3	-	25
2/12/2023	-	3	-	25
3/12/2023	-	4	-	25
4/12/2023	-	5	-	25
5/12/2023	-	5	-	25
6/12/2023	-	7	-	25
7/12/2023	-	11	-	25
8/12/2023	-	10	-	25
9/12/2023	-	15	-	25
10/12/2023	-	9	-	25
11/12/2023	-	16	-	25
12/12/2023	-	8	-	25
13/12/2023	-	12	-	25
14/12/2023	-	9	-	25
15/12/2023	11	11	-	25
16/12/2023	8	8	-	25
17/12/2023	10	9	-	25
18/12/2023	17	16	-	25
19/12/2023	**29**	22	-	25
20/12/2023	15	17	-	25
21/12/2023	4	4	-	25
22/12/2023	6	5	-	25
23/12/2023	6	7	-	25
24/12/2023	7	7	-	25
25/12/2023	9	8	-	25
26/12/2023	6	9	-	25
27/12/2023	6	6	-	25
28/12/2023	5	6	-	25
29/12/2023	5	5	-	25
30/12/2023	6	5	-	25
31/12/2023	7	5	-	25

Notes:
*Results in **bold** indicate elevated readings during adverse weather conditions.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)

Figure 6-3 below shows the results of real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites in December 2023.

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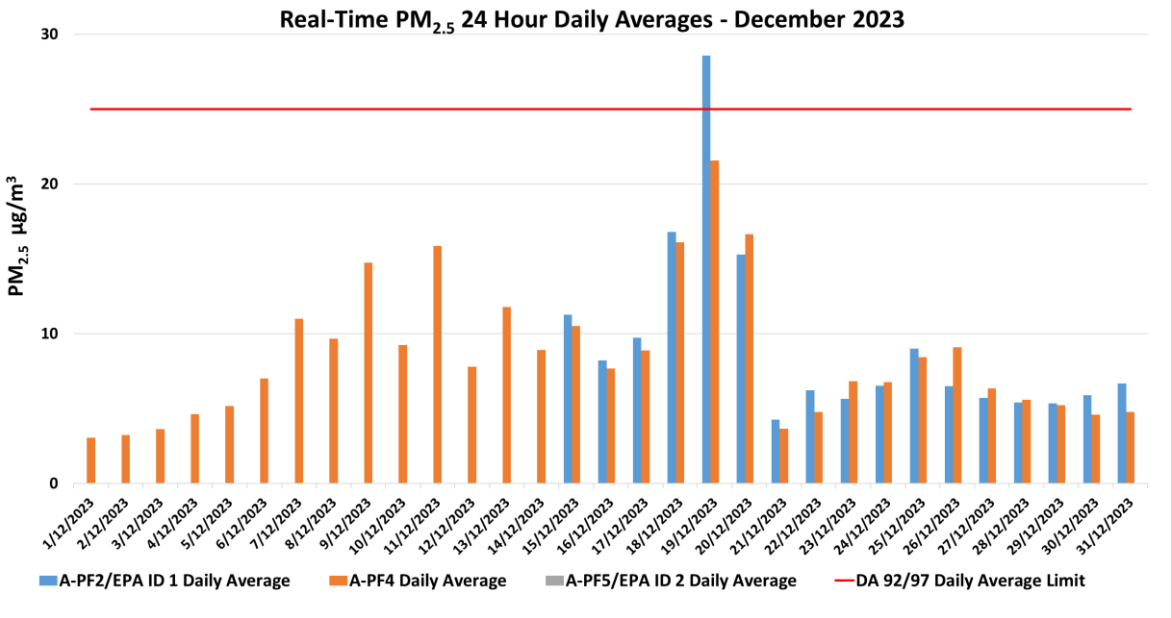

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for December 2023.

6.4 $PM_{2.5}$ Results - Annual Rolling Average

There was no exceedance of the $PM_{2.5}$ annual rolling average reported at MPO during December 2023. Real time $PM_{2.5}$ annual rolling averages during the reporting period are presented in **Figure 6-4** below.

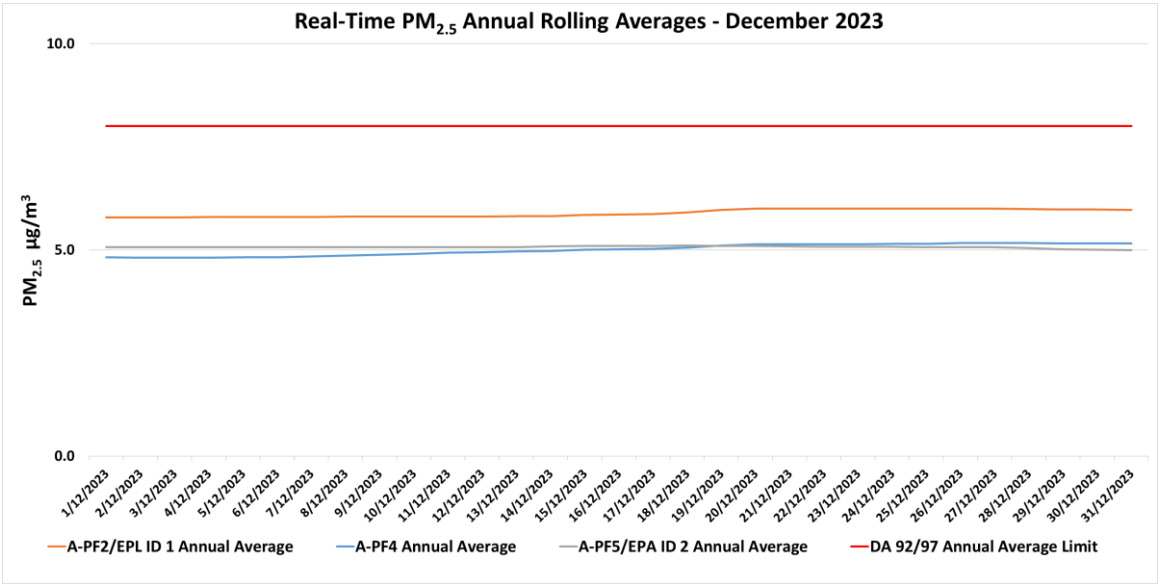

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for December 2023.

7. Surface Water Monitoring

7.1 Methodology

Surface water quality is monitored at 14 sites on a monthly basis, with additional monitoring conducted if triggered by a rain event. A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

7.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2022) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines.

7.3 Results

Surface water monitoring was conducted by AECOM on 22 December 2023. Laboratory analysis was performed by Eurofins, a NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 7-1.**

Table 7-1 – MPO Monthly Surface Water Monitoring Results – 22 December 2023

Station	pH	Electrical Conductivity (EC) (µs/cm)[1]	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
W1	7.9	518	299	9
W2	8.0	**880**	458	12
W3	7.9	540	291	14
W4	7.5	1380	745	12
W5	*	*	*	*
W6A	8.1	**900**	541	12
W9	*	*	*	*
W11	8.1	3960	2040	6
W12	8.1	4580	2460	<5
W13	7.9	4120	2440	18
W14	*	*	*	*
W15	7.9	589	362	28
W16	8.1	5160	2860	14
W17	7.9	585	378	18

*Note: Results in **bold** indicate exceedances of adopted assessment criteria.*
**Dry or insufficient water to sample.*
[1] Results have been rounded in accordance with the In-house method Q4AN(EV)-332-WI2 (EC).

During the 22 December monitoring event, three (3) sites were dry or contained insufficient water to sample. All sites were within/below their respective pH and TSS trigger levels. All sites were within their respective EC trigger levels with the exception of sites W2 and W6A.

An investigation is triggered if elevated measurements occur for three consecutive sampling events in accordance MPO Water Management Plan (MACH Energy, 2022). Any investigation findings will be included in the 2023 Annual Environmental Monitoring Report (AEMR).

8. Groundwater Monitoring

Groundwater monitoring did not occur in this reporting period. The next quarterly monitoring event is scheduled for February 2024.

9. Noise Monitoring

Attended noise monitoring was undertaken during the night period of 7/8 December 2023 at six (6) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2021) in accordance with DA 92/97 and EPL 20850.

9.1 Results

The results for nighttime attended noise monitoring for noise generated by MPO in December 2023 against noise criteria is shown in **Table 9-1**; **Table 9-2;** and **Table 9-3.**

Table 9-1 – $L_{A1,1min}$ Generated by MPO: Attended Night Monitoring – 7/8 December 2023

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies[1]	MPO Only $L_{A1,1min}$ dB[2,4]	Exceedance dB[3]
N-AT1	8/12/2023 00:48	1.5	E	45	Yes	IA	No
N-AT2	7/12/2023 22:29	6.7	D	45	No	26	NA
N-AT3	7/12/2023 23:04	3.8	D	45	No	IA	NA
N-AT4	7/12/2023 23:30	1.4	E	45	Yes	IA	No
N-AT5	7/12/2023 23:51	1.9	D	45	Yes	IA	No
N-AT6	8/12/2023 00:25	1.4	F	45	Yes	IA	No

Notes:

1. *As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.*
2. *Estimated or measured $L_{A1,1minute}$ attributed to MPO.*
3. *NA in exceedance column means meteorological conditions outside those specified in Condition L2.3 of EPL 20850 and thus criterion is not applicable.*
4. *IA = inaudible; and*
5. *Bold results indicate exceedance of criteria.*
6. *Monitoring at N-AT5 was unable to be conducted due to a road closure.*

Table 9-2 – $L_{Aeq,15min}$ Generated by MPO: Attended Night Monitoring – 7/8 December 2023

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies[1]	MPO Only L_{Aeq} dB[2,3]	Exceedance dB
N-AT1	8/12/2023 00:48	1.5	E	43	Yes	IA	No
N-AT2	7/12/2023 22:29	6.7	D	36	No	22	NA
N-AT3	7/12/2023 23:04	3.8	D	41	No	IA	NA
N-AT4	7/12/2023 23:30	1.4	E	42	Yes	IA	No
N-AT5	7/12/2023 23:51	1.9	D	40	Yes	IA	No
N-AT6	8/12/2023 00:25	1.4	F	35	Yes	IA	No

Notes:

1. *As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.*
2. *Estimated or measured $L_{Aeq,15minute}$ attributed to MPO.*
3. *IA = inaudible; and*
4. *Bold results indicate exceedance of criteria.*
5. *Monitoring at N-AT5 was unable to be conducted due to a road closure.*

Table 9-3 – $L_{Aeq,\ period}$ Cumulative Noise: Attended Night Monitoring – 7/8 December 2023

Location	Start Date and Time	Cumulative Noise Criterion LAeq dB	Measured Mining Only $L_{Aeq,\ period}$ dB[1,2,3]	Exceedance dB
N-AT1	8/12/2023 00:48	40	33	No
N-AT2	7/12/2023 22:29	40	22	NA
N-AT3	7/12/2023 23:04	40	IA	NA
N-AT4	7/12/2023 23:30	40	IA	No
N-AT5	7/12/2023 23:51	40	26	No
N-AT6	8/12/2023 00:25	40	35	No

Notes:

1. *These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results; and*
2. *By definition, cumulative noise refers to two or more noise sources. If only one other source of mining is audible, or if MPO is inaudible, the measured cumulative noise defined here is 'Nil'.*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions.*
4. *Monitoring at N-AT5 was unable to be conducted due to a road closure.*

The purpose of the noise monitoring is to quantify and describe the existing acoustic environment around the mining operation and compare results with relevant limits as per the *MPO Noise Management Plan* (MACH Energy, 2021).

10. Blast Monitoring

There were 5 blast events during December (a total of 72 blasts YTD). Results for December 2023 are presented in **Table 10-1**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97 and L5 of EPL 20850.

Table 10-1 – MPO Blast Monitoring Results - December 2023

Day & Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
Friday 1/12/2023	11:46	1.100	101.6	0.240	98.7	Y
Wednesday 6/12/2023	13:33	0.860	106.2	0.360	106.2	Y
Wednesday 13/12/2023	12:58	0.370	88.5	0.440	95.1	Y
Friday 15/12/2023	10:16	0.450	96.0	0.370	100.3	Y
Thursday 21/12/2023	12:08	0.720	94.6	0.530	94.4	Y

END OF REPORT