Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

August 2021

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Revision History

Version No.	Version Details	Document Status	Date
1.0	**Environment and Community Advisor**	**Final**	**12/11/2021**

1.0 INTRODUCTION

This report has been compiled to provide a monthly summary of environmental monitoring results for Mount Thorley Warkworth (MTW). This report includes all monitoring data collected for the period 1 August to 31 August 2021.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

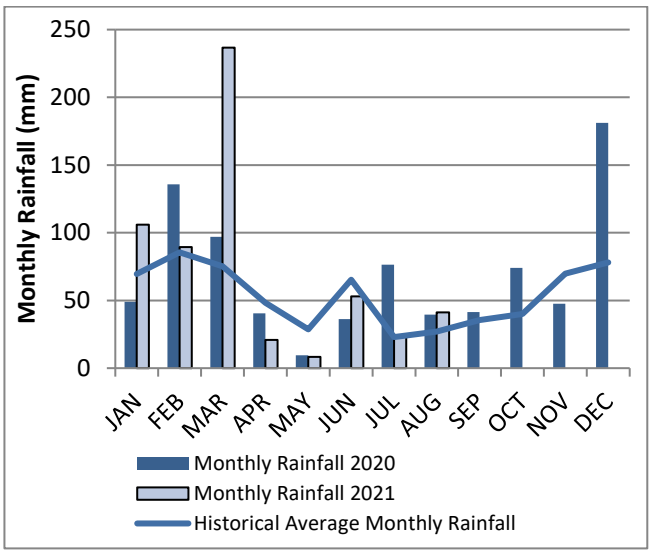
Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

2.1.1 Rainfall

Rainfall for the reporting period is summarised in **Table 1**. The year-to-date monthly rainfall totals, 2021 monthly rainfall totals and historical average monthly rainfall trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2021	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
August	41.2	578.4



Note: The historical average monthly rainfall is calculated from 2007 to 2020 monthly totals

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

Winds from the north west were dominant during the reporting period as shown in **Figure 2.**

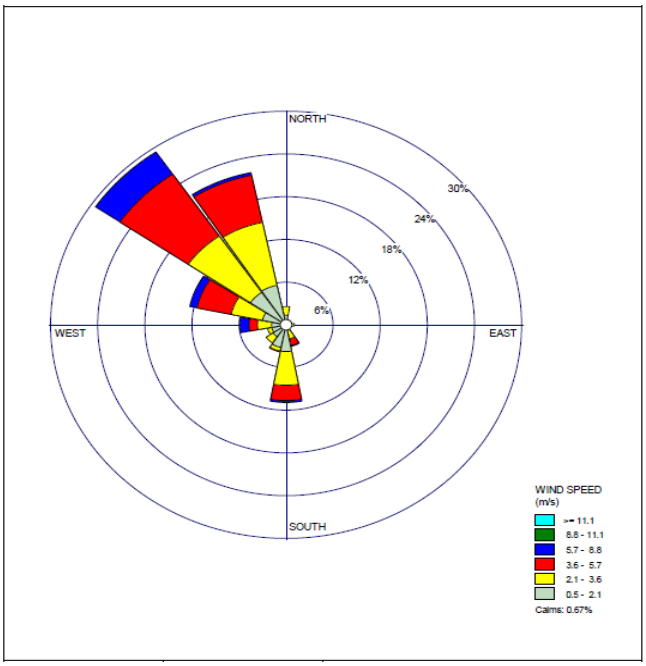


Figure 2: Charlton Ridge Wind Rose – August 2021

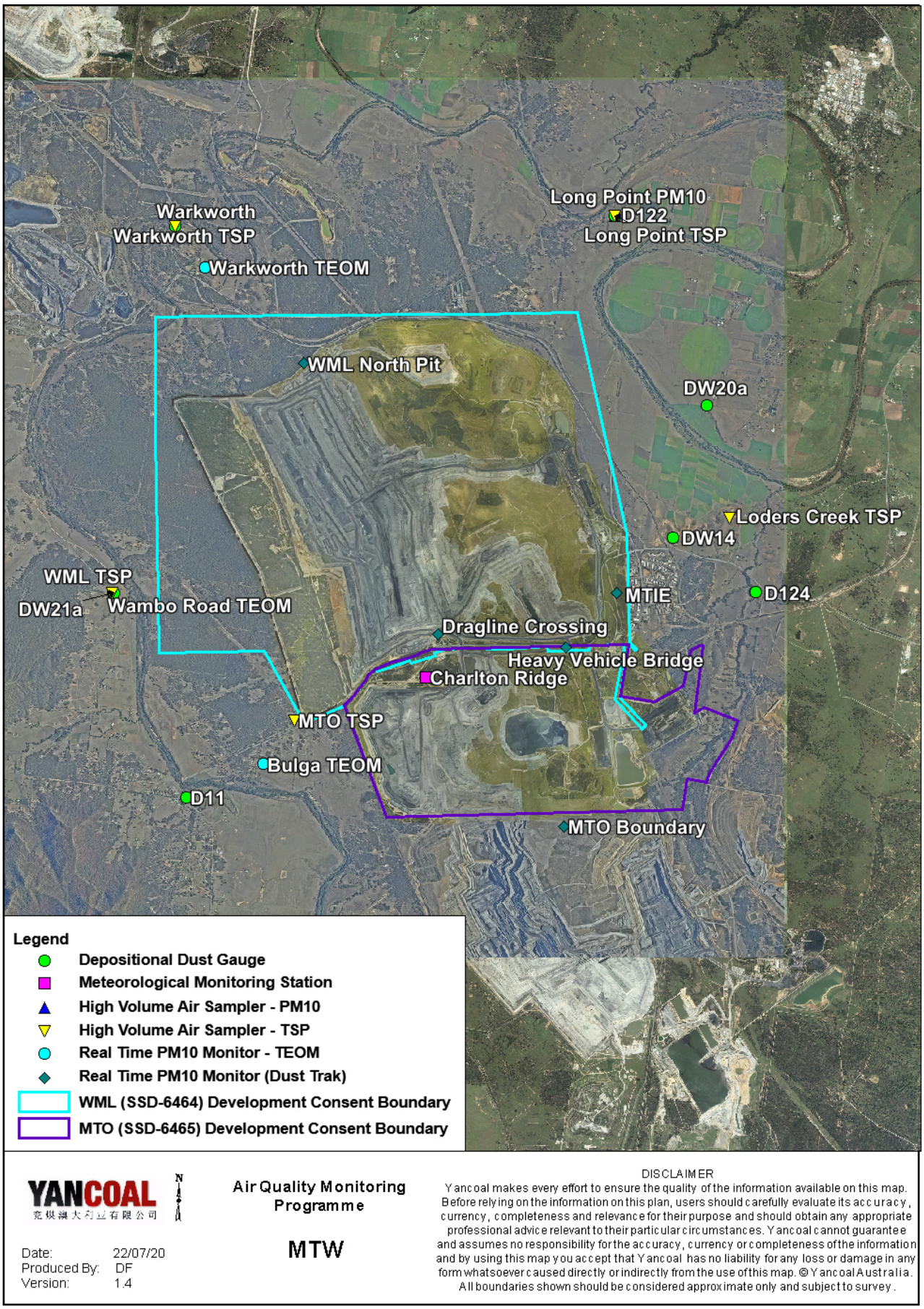


Figure 3: Air Quality Monitoring Locations

2.2 Depositional Dust

To monitor air quality, MTW operates and maintains a network of seven depositional dust gauges, situated on private and mine owned land surrounding MTW.

During the reporting period the Warkworth monitor recorded a monthly result above the long-term impact assessment criteria of 4.0 g/m^2 per month. There is no evidence to suggest that the Warkworth result is contaminated. An external investigation of an elevated result at this monitor was undertaken for a July 2021 reading, which indicated the July result was anomalous and was then excluded from annual average calculation. Despite this, the August result has remained elevated compared to other depositional dust results. It is noted in **Figure 2** that prevailing winds were not from the direction of MTW for the month of August 2021 at the Warkworth monitor. Further investigation is proposed to determine possible reasons for the result. Presently, the result is included in the annual average calculation.

Figure 4 displays insoluble solids results from depositional dust gauges during the reporting period compared against the year-to-date average and the annual impact assessment criteria.

An annual assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2021 Annual Review Report.

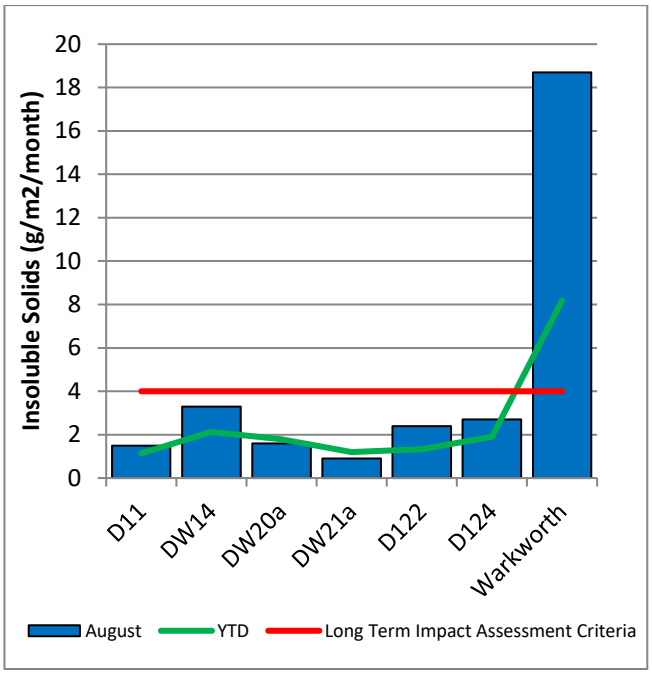


Figure 4: Depositional Dust – August 2021

2.3 Suspended Particulates

Suspended particulates are measured by a network of High Volume Air Samplers (HVAS) measuring Total Suspended Particulates (TSP) and Particulate Matter <10µm (PM_{10}). The location of these monitors can be found in **Figure 3**. Each HVAS was run for 24 hours on a six-day cycle in accordance with EPA requirements.

2.3.1 HVAS PM_{10} Results

Figure 5 shows the individual PM_{10} results at each monitoring station against the short-term impact assessment criteria of 50µg/m^3.

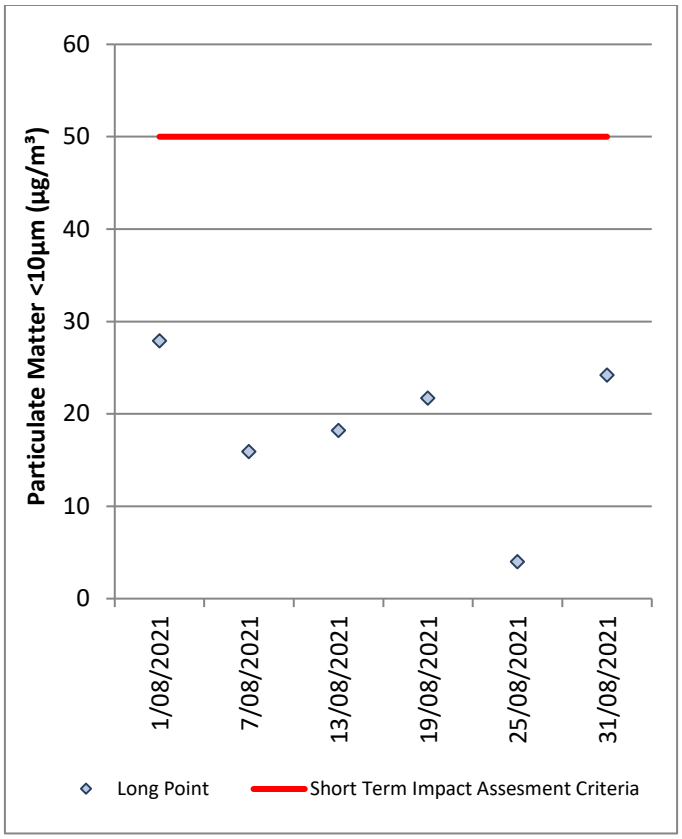


Figure 5: Individual PM10 Results – August 2021

Figure 6 shows the annual average PM10 result against the long term impact assessment criteria.

An assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2021 Annual Review Report.

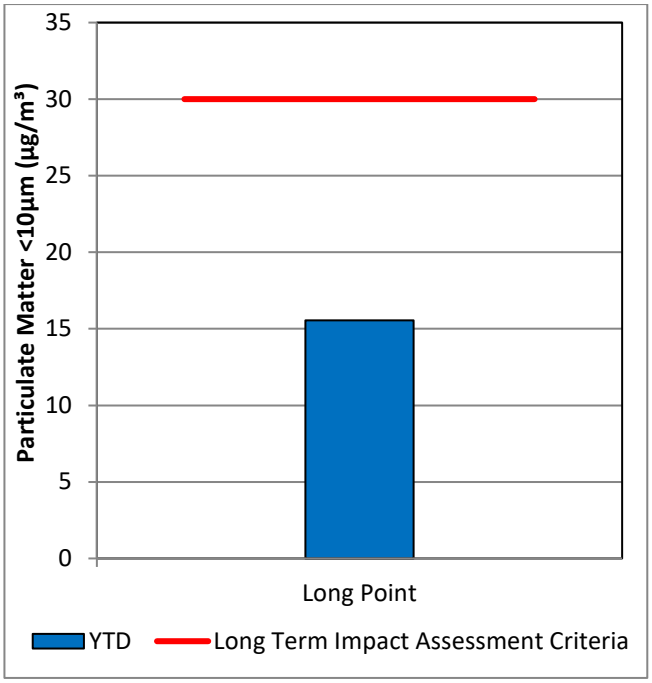


Figure 6: Annual Average PM_{10} – August 2021

2.3.2 TSP Results

Figure 7 shows the annual average TSP results compared against the long-term impact assessment criteria of 90µg/m³. An assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2021 Annual Review Report.

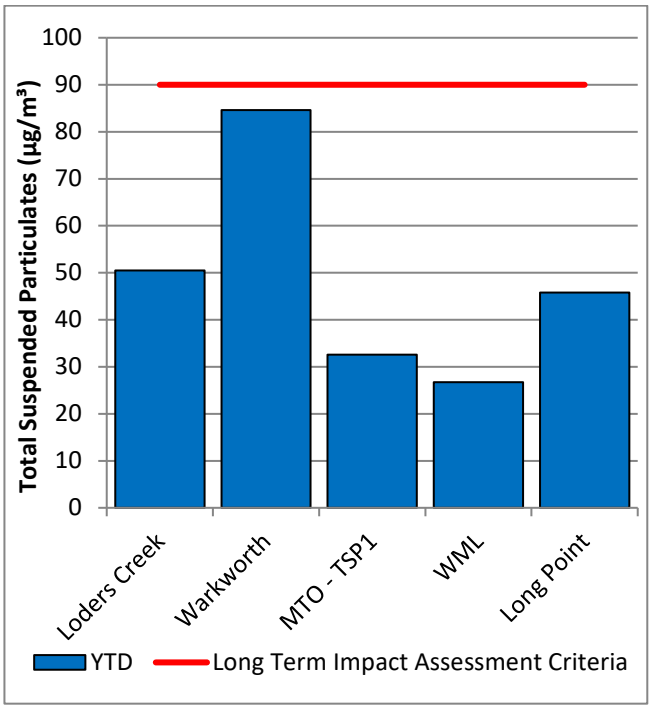


Figure 7: Annual Average Total Suspended Particulates – August 2021

2.3.3 Real Time PM_{10} Results

MTW maintains a network of real time PM_{10} monitors. The real time air quality monitoring stations continuously log information and transmit data to a central database, generating internal alerts when particulate matter levels exceed internal trigger limits.

Results for real time dust sampling are shown in **Figure 8**, including the daily 24-hour average PM_{10} result and the annual PM_{10} average.

2.3.4 Real Time Alarms for Air Quality

During August, the real time monitoring system generated 114 automated air quality related alerts, including 19 alerts for adverse meteorological conditions and 95 alerts for elevated PM_{10} levels.

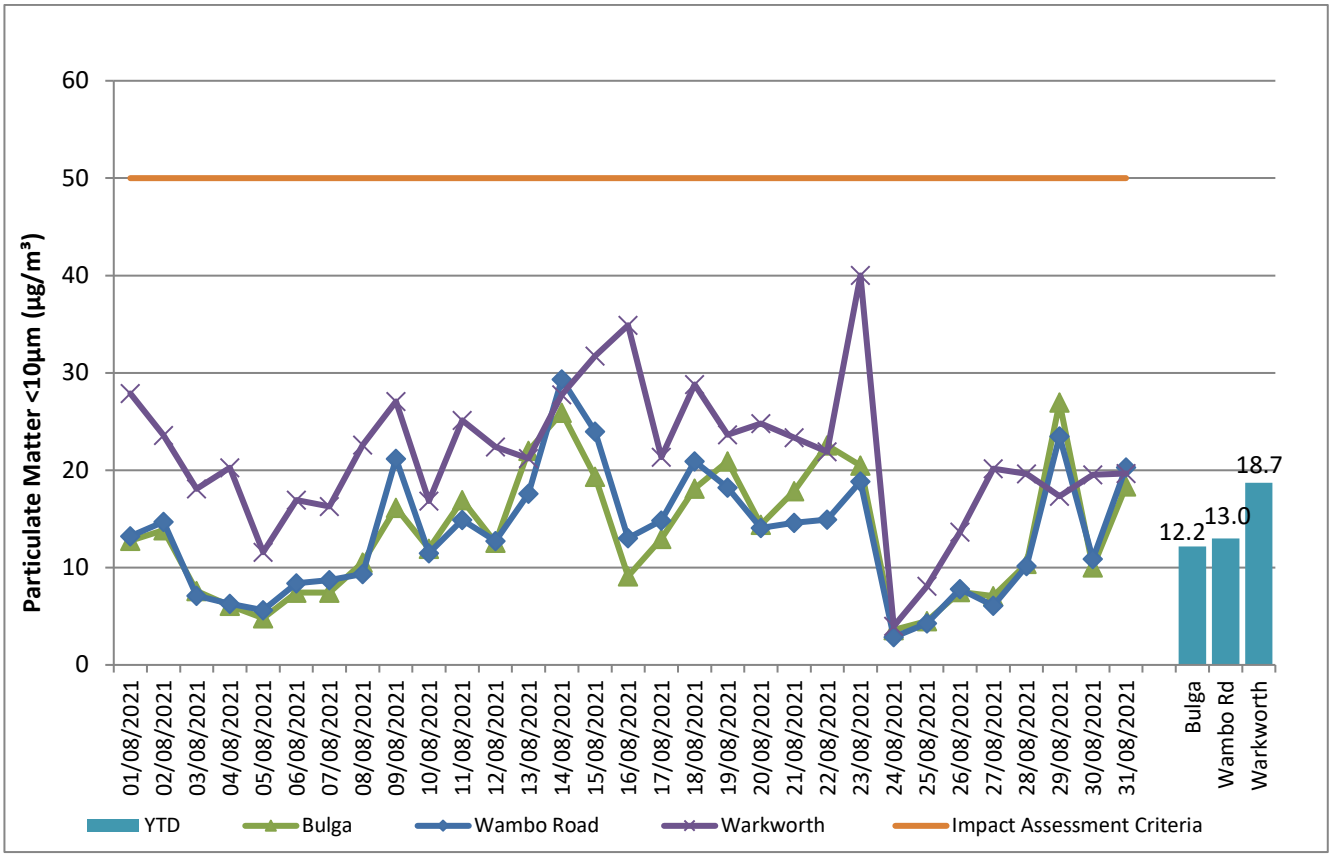


Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – August 2021

3.0 WATER QUALITY

MTW maintains a network of surface water and groundwater monitoring sites.

3.1 Surface Water

Monitoring is conducted at mine site dams and surrounding natural watercourses.

Surface water courses are sampled on a monthly or quarterly sampling regime. Water quality is evaluated through the parameters of pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS). The Hunter River and the Wollombi Brook are sampled both upstream and downstream of mining operations, to record background water quality and to monitor the potential impact of mining on the river system. Other Hunter River tributaries are also monitored.

Results of monitoring are reported quarterly, next available in the September 2021 report.

3.2 HRSTS Discharge

MTW participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points located at Dam 1N and Dam 9S. Discharges can only take place subject to HRSTS regulations.

During the reporting month no water was discharged under the HRSTS.

3.3 Groundwater Monitoring

Groundwater monitoring is undertaken on a quarterly basis in accordance with the MTW Groundwater Monitoring Programme.

Groundwater results are reported quarterly, next available in the September 2021 report.

4.0 BLAST MONITORING

MTW have a network of six blast monitoring units. These are located at nearby privately owned residences and function as regulatory compliance monitors.

The location of these monitors can be found in **Figure 15**.

4.1 Blast Monitoring Results

During August 2021, 18 blasts were initiated at MTW. **Figure 9** to **Figure 14** show the blast monitoring results for the reporting period against the impact assessment criteria. The criteria are summarised in **Table 2**.

Table 2: Blasting Limits

Airblast Overpressure (dB(L))	Comments
115	5% of the total number of blasts in a 12 month period at WML or MTO
120	0%
Ground Vibration (mm/s)	**Comments**
5	5% of the total number of blasts in a 12 month period at WML or MTO
10	0%

During the reporting period no blast exceeded the 115 dB(L) 5% threshold for airblast overpressure or the 5mm/s 5% criteria for ground vibration.

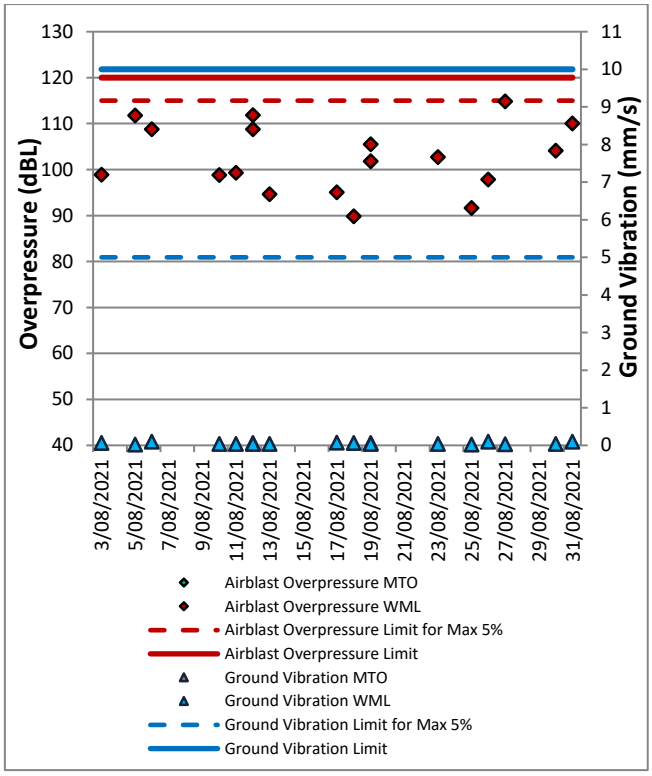


Figure 9: Abbey Green Blast Monitoring Results – August 2021

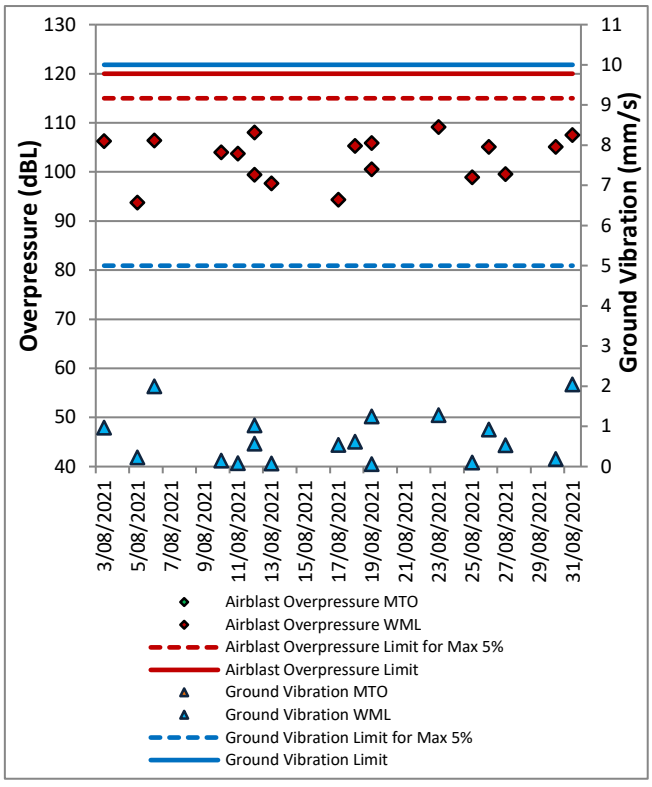


Figure 10: Bulga Village Blast Monitoring Results – August 2021

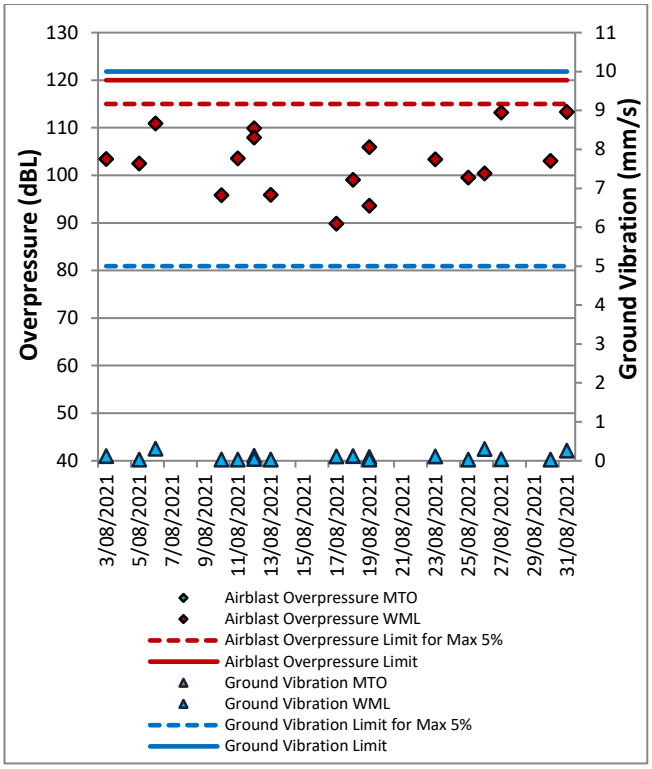


Figure 11: MTIE Blast Monitoring Results – August 2021

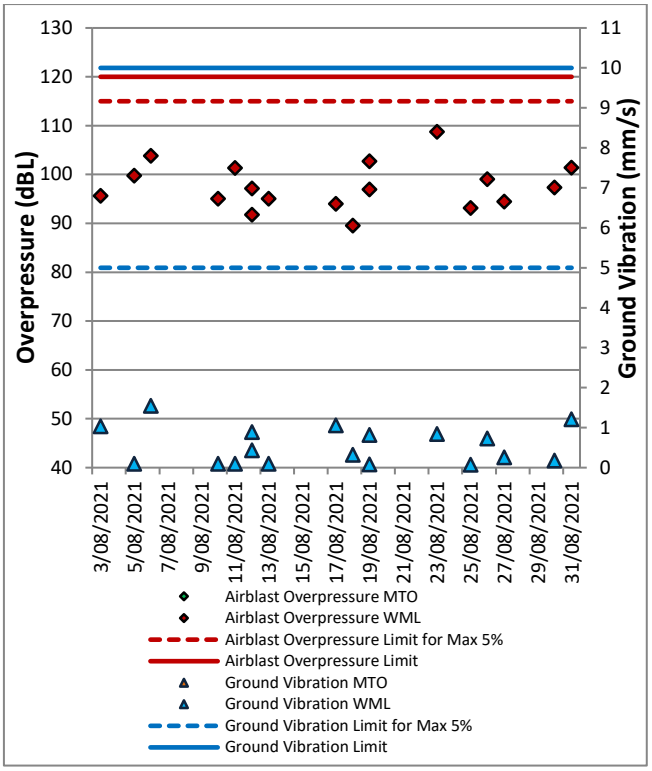


Figure 13: Wambo Road Blast Monitoring Results – August 2021

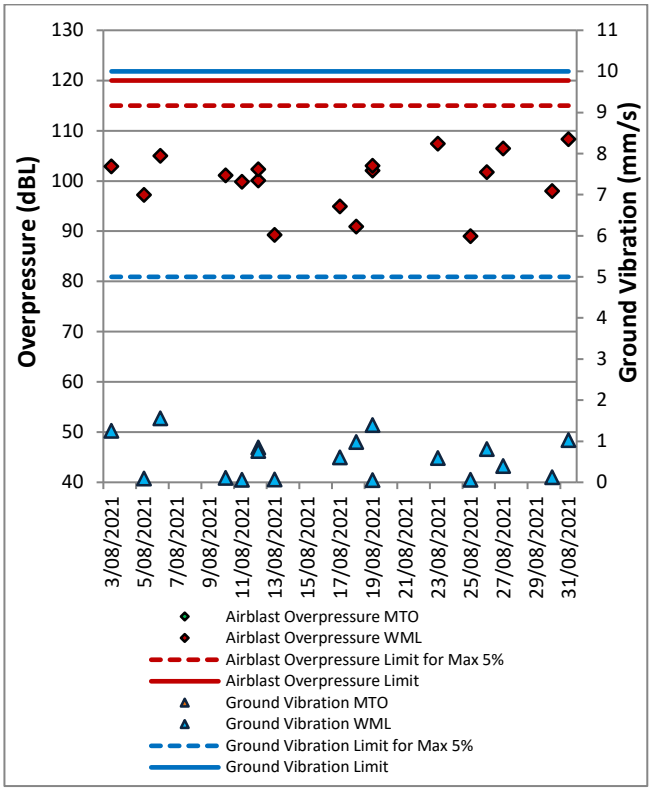


Figure 12: Wollemi Peak Road Blast Monitoring Results – August 2021

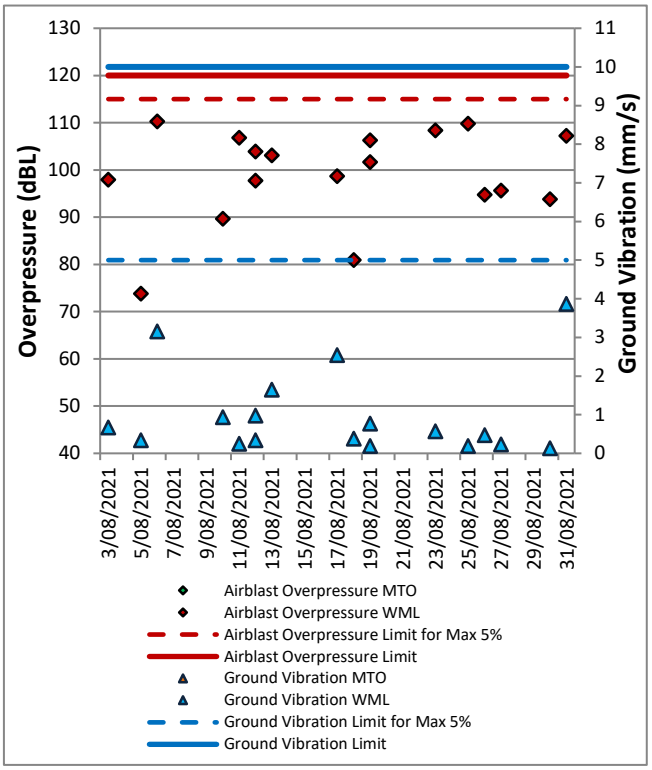


Figure 14: Warkworth Blast Monitoring Results – August 2021

Figure 15: MTW Blast Monitoring Location Plan

5.0 NOISE

Routine attended noise monitoring is carried out in accordance with the MTW Noise Management Plan. A review against EIS predictions will be reported in the Annual Review. The purpose of the noise surveys is to quantify and describe the acoustic environment around the site and compare results with specified limits. Real time noise monitoring also occurs at five sites surrounding MTW. Noise monitoring locations are displayed in **Figure 16**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 10/11 August 2021. All measurements complied with the relevant criteria. Results are detailed in **Table 3 to Table 6.**

5.1.1 WML Noise Assessment

Compliance assessments undertaken against the WML noise criteria are presented in **Tables 3** and **4**.

Table 3: $L_{Aeq,\ 15\ minute}$ Warkworth Impact Assessment Criteria – August 2021

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML L_{Aeq} dB[2,3,4]	Exceedance[3,5]
Bulga RFS	11/08/2021 0:00	1.4	E	37	Yes	35	Nil
Bulga Village	10/08/2021 23:16	1	D	38	Yes	31	Nil
Gouldsville	10/08/2021 21:24	0.5	F	38	Yes	IA	Nil
Inlet Rd	10/08/2021 21:23	0.5	F	37	Yes	25	Nil
Inlet Rd West	10/08/2021 21:00	1.5	E	35	Yes	<20	Nil
Long Point	10/08/2021 21:00	1.5	E	35	Yes	IA	Nil
South Bulga	11/08/2021 0:18	1.7	D	35	Yes	32	Nil
Wambo Road	10/08/2021 21:48	0.4	F	38	Yes	<25	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LAeq,15minute attributed to WML, including modifying factors if applicable;
3. Bold results in red indicate exceedances of relevant criteria;
4. IA denotes 'Inaudible'; and
5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.
6. NM denotes 'not measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.

Table 4: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – August 2021

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML $L_{A1,\ 1min}$ dB[2,3,4]	Exceedance[3,5]
Bulga RFS	11/08/2021 0:00	1.4	E	47	Yes	45	Nil
Bulga Village	10/08/2021 23:16	1	D	48	Yes	35	Nil
Gouldsville	10/08/2021 21:24	0.5	F	48	Yes	IA	Nil
Inlet Rd	10/08/2021 21:23	0.5	F	47	Yes	30	Nil
Inlet Rd West	10/08/2021 21:00	1.5	E	45	Yes	<20	Nil
Long Point	10/08/2021 21:00	1.5	E	45	Yes	IA	Nil
South Bulga	11/08/2021 0:18	1.7	D	45	Yes	40	Nil
Wambo Road	10/08/2021 21:48	0.4	F	48	Yes	35	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LA1,1minute attributed to WML;
3. Bold results in red are possible exceedances of relevant criteria; and

4. IA denotes 'Inaudible'; and
5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.
6. NM denotes 'not measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.

5.1.3 MTO Noise Assessment

Compliance assessments undertaken against the MTO noise criteria are presented in **Table 5** and **6**.

Table 5: $L_{Aeq,\ 15minute}$ Mount Thorley - Impact Assessment Criteria – August 2021

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3,4]	Exceedance[3,5]
Bulga RFS	11/08/2021 0:00	1.4	E	37	Yes	IA	Nil
Bulga Village	10/08/2021 23:16	1	D	38	Yes	IA	Nil
Gouldsville	10/08/2021 21:24	0.5	F	35	Yes	IA	Nil
Inlet Rd	10/08/2021 21:23	0.5	F	37	Yes	IA	Nil
Inlet Rd West	10/08/2021 21:00	1.5	E	35	Yes	<20	Nil
Long Point	10/08/2021 21:00	1.5	E	35	Yes	IA	Nil
South Bulga	11/08/2021 0:18	1.7	D	36	Yes	IA	Nil
Wambo Road	10/08/2021 21:48	0.4	F	38	Yes	IA	Nil

Notes:
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LAeq,15minute attributed to MTO, including modifying factors if applicable;
3. Bold results in red indicate exceedances of relevant criteria; and
4. IA denotes 'Inaudible'; and
5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 6: $L_{A1,\ 1Minute}$ Mount Thorley - Impact Assessment Criteria – August 2021

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1,\ 1min}$ dB[2,3,4]	Exceedance[3,5]
Bulga RFS	11/08/2021 0:00	1.4	E	**47**	Yes	IA	Nil
Bulga Village	10/08/2021 23:16	1	D	**48**	Yes	IA	Nil
Gouldsville	10/08/2021 21:24	0.5	F	**45**	Yes	IA	Nil
Inlet Rd	10/08/2021 21:23	0.5	F	**47**	Yes	IA	Nil
Inlet Rd West	10/08/2021 21:00	1.5	E	**45**	Yes	25	Nil
Long Point	10/08/2021 21:00	1.5	E	**45**	Yes	IA	Nil
South Bulga	11/08/2021 0:18	1.7	D	**46**	Yes	IA	Nil
Wambo Road	10/08/2021 21:48	0.4	F	**48**	Yes	IA	Nil

Notes
1. Noise criteria apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Site-only LAeq,15minute attributed to MTO;
3. Bold results in red indicate exceedances of relevant criteria; and
4. IA denotes 'Inaudible'; and
5. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

5.1.4 NPfI Low Frequency Assessment

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfI), the applicability of the low frequency modification factor corrections has been assessed. There were no noise measurements taken during the reporting period which required the penalty to be applied. The WML assessment for low frequency noise is shown in **Table 7** and the MTO assessment for low frequency noise is shown in **Table 8**: Mount Thorley Operations Low Frequency Noise Assessment

Table 7: Warkworth Low Frequency Noise Assessment – August 2021

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[2]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [2,3]	Penalty dB[2]	Exceedance
Bulga RFS	11/08/2021 0:00	35	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	10/08/2021 23:16	31	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	10/08/2021 21:24	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	10/08/2021 21:23	25	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	10/08/2021 21:00	<20	Yes	No	No	NA	No	NA	Nil	NA
Long Point	10/08/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	11/08/2021 0:18	32	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	10/08/2021 21:48	<25	Yes	No	No	NA	No	NA	Nil	NA

Notes:
1. IA denotes 'Inaudible';
2. NA denotes 'Not Applicable'; and
3. Bold results indicate that application of NPfI modifying factor/s is required.

Table 8: Mount Thorley Operations Low Frequency Noise Assessment – August 2021

Location	Date and Time	Measured WML LAeq dB[1]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[2]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [2,3]	Penalty dB[2]	Exceedance
Bulga RFS	11/08/2021 0:00	IA	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	10/08/2021 23:16	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	10/08/2021 21:24	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	10/08/2021 21:23	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	10/08/2021 21:00	<20	Yes	No	No	NA	No	NA	Nil	NA
Long Point	10/08/2021 21:00	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	11/08/2021 0:18	IA	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	10/08/2021 21:48	IA	Yes	No	No	NA	No	NA	Nil	NA

Notes:
1. IA denotes 'Inaudible';
2. NA denotes 'Not Applicable'; and
3. Bold results indicate that application of NPfI modifying factor/s is required.

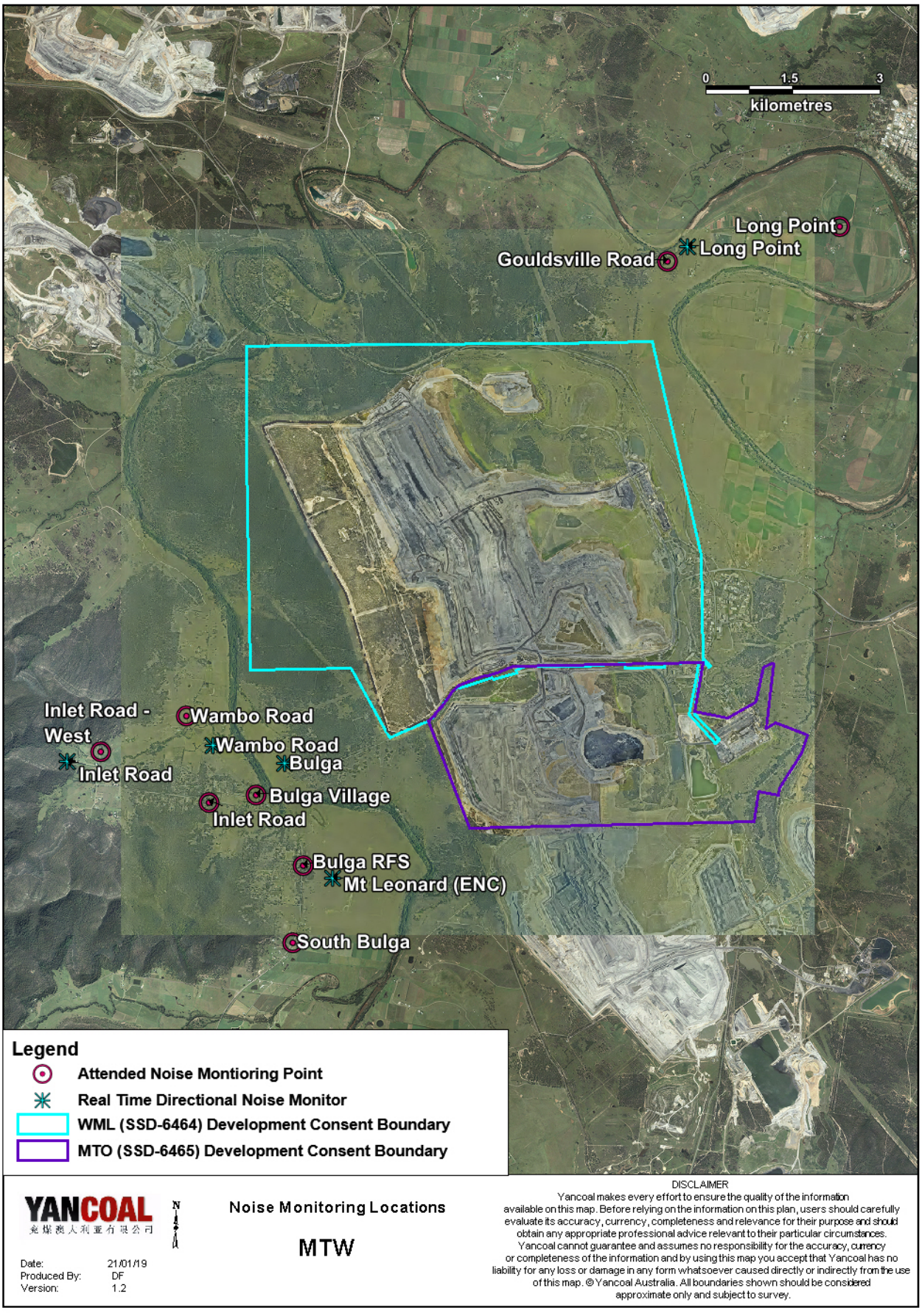


Figure 16: Noise Monitoring Location Plan

5.2 Noise Management Measures

A program of targeted supplementary attended noise monitoring is in place at MTW, supported by the real-time directional monitoring network and ensuring the highest level of noise management is maintained. The supplementary program is undertaken by MTW personnel and involves:

- Routine inspections from both inside and outside the mine boundary;
- Routine and as-required handheld noise assessments (undertaken in response to noise alarm and/or community complaint), comparing measured levels against consent noise limits; and
- Validation monitoring following operational modifications to assess the adequacy of the modifications.

Where a noise assessment identifies noise emissions which are exceeding the relevant noise limit(s) for any particular residence, modifications will be made to ensure that the noise event is resolved within 75 minutes of identification. The actions taken are commensurate with the nature and severity of the noise event, but can include:

- Changing the haul route to a less noise sensitive haul;
- Changing dump locations (in-pit or less exposed dump option);
- Reducing equipment numbers;
- Shut down of task; or
- Site shut down.

A summary of these assessments undertaken during August are provided in **Table 9**.

Table 9: Supplementary Attended Noise Monitoring Data – August 2021

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
690	21	7	3.04

Note: Measurements are taken under all meteorological conditions, including conditions under which the consent noise criteria do not apply.

6.0 OPERATIONAL DOWNTIME

During August, a total of 256 hours of equipment downtime was logged in response to environmental events such as dust, noise and adverse meteorological conditions. Operational downtime by equipment type is shown in **Figure 17**.

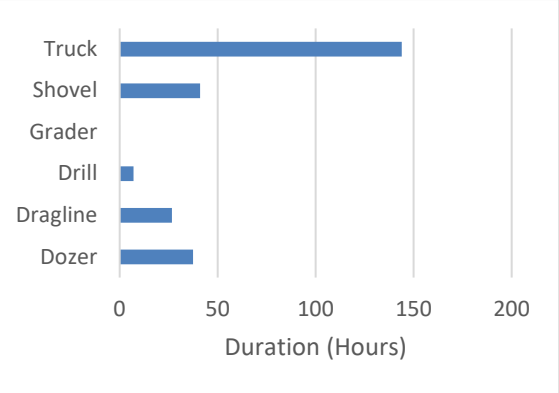


Figure 17: Operational Downtime by Equipment Type – August 2021

7.0 REHABILITATION

During August 2021, 12.4 Ha of land was released, 4.0 Ha of land was bulk shaped, 1.3 Ha of land was topsoiled, 0.9 Ha of land was composted and 17.4 Ha of land was rehabilitated.

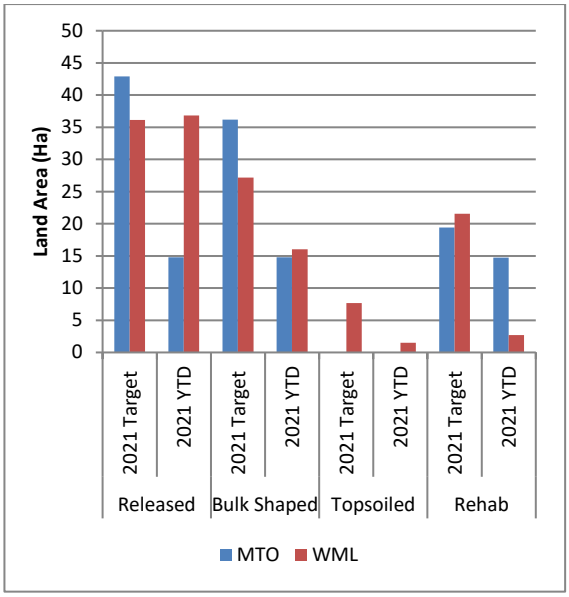


Figure 18: Rehabilitation YTD – August 2021

8.0 ENVIRONMENTAL INCIDENTS

There were no reportable environmental incidents recorded during the reporting period.

9.0 COMPLAINTS

26 complaints were received during the reporting period. Details of these complaints are shown in **Table 10** below.

Table 10: Complaints Summary YTD

	Noise	Dust	Blast	Lighting	Other	Total
January	1	0	6	4	1	12
February	4	0	3	0	0	7
March	5	0	3	3	1	12
April	6	2	1	10	0	19
May	3	1	10	5	0	19
June	2	0	4	0	0	6
July	1	0	5	3	1	10
August	12	8	5	1	0	26
September						
October						
November						
December						
Total	34	11	37	26	3	111

Appendix A: Meteorological Data

Table 11: Meteorological Data – Charlton Ridge Meteorological Station – August 2021

Date	Air Temperature Maximum (°C)	Air Temperature Minimum (°C)	Relative Humidity Maximum (%)	Relative Humidity Minimum (%)	Wind Direction Average (°)	Wind Speed Average (m/sec)	Rainfall(mm)
1/08/2021	25	8	89	35	296	3.2	0.0
2/08/2021	20	5	92	46	140	2.6	0.0
3/08/2021	20	5	99	32	272	3.5	1.6
4/08/2021	15	4	77	33	291	4.1	0.0
5/08/2021	20	2	85	33	278	4.0	0.0
6/08/2021	19	1	85	34	309	3.5	0.0
7/08/2021	18	0	91	38	295	3.1	0.0
8/08/2021	17	1	97	55	198	2.1	1.4
9/08/2021	19	5	95	45	149	1.9	0.0
10/08/2021	22	2	98	38	237	1.6	0.0
11/08/2021	23	2	95	35	273	3.0	0.0
12/08/2021	22	4	77	34	244	2.8	0.0
13/08/2021	20	1	85	35	187	1.8	0.0
14/08/2021	21	1	90	31	178	1.5	0.0
15/08/2021	22	2	98	18	270	2.6	0.0
16/08/2021	22	3	67	19	296	3.5	0.0
17/08/2021	19	2	79	29	245	2.8	0.0
18/08/2021	20	1	87	34	159	2.1	0.0
19/08/2021	22	1	96	30	231	2.0	0.0
20/08/2021	24	2	94	27	262	2.1	0.0
21/08/2021	21	6	94	36	264	2.1	1.6
22/08/2021	27	3	89	17	236	1.9	0.0
23/08/2021	24	10	97	41	291	3.2	5.0
24/08/2021	14	3	99	78	266	3.5	31.4
25/08/2021	17	-	88	-	282	3.2	0.0
26/08/2021	19	0	95	39	246	2.4	0.2
27/08/2021	17	3	92	33	286	2.8	0.0
28/08/2021	19	2	76	25	295	3.8	0.0
29/08/2021	19	-1	93	24	211	1.5	0.0
30/08/2021	20	2	87	27	254	2.0	0.0
31/08/2021	23	1	89	20	234	1.9	0.0

"-" Indicates that data was not available due to technical issues.