Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

January 2021

CONTENTS

Figures

Tables

Revision History

Version No.	Version Details	Document Status	Date
1.0	**Environment and Community Coordinator**	**Final**	**12/05/2021**

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 January to 31 January 2021.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

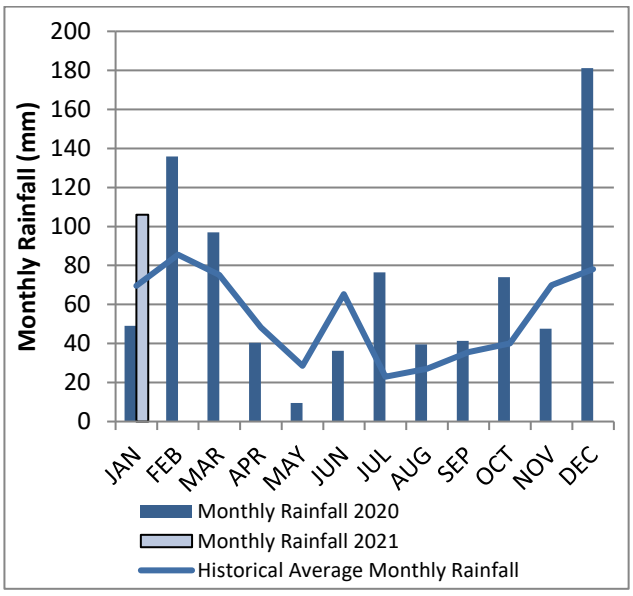
Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

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)
January	106.0	106.0



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 southeast were dominant during the reporting period as shown in **Figure 2.**

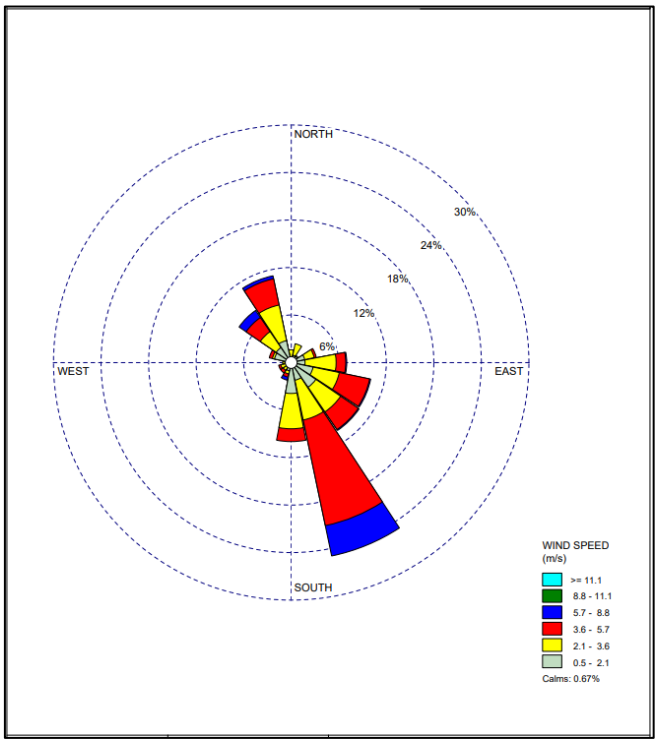


Figure 2: Charlton Ridge Wind Rose – January 2021

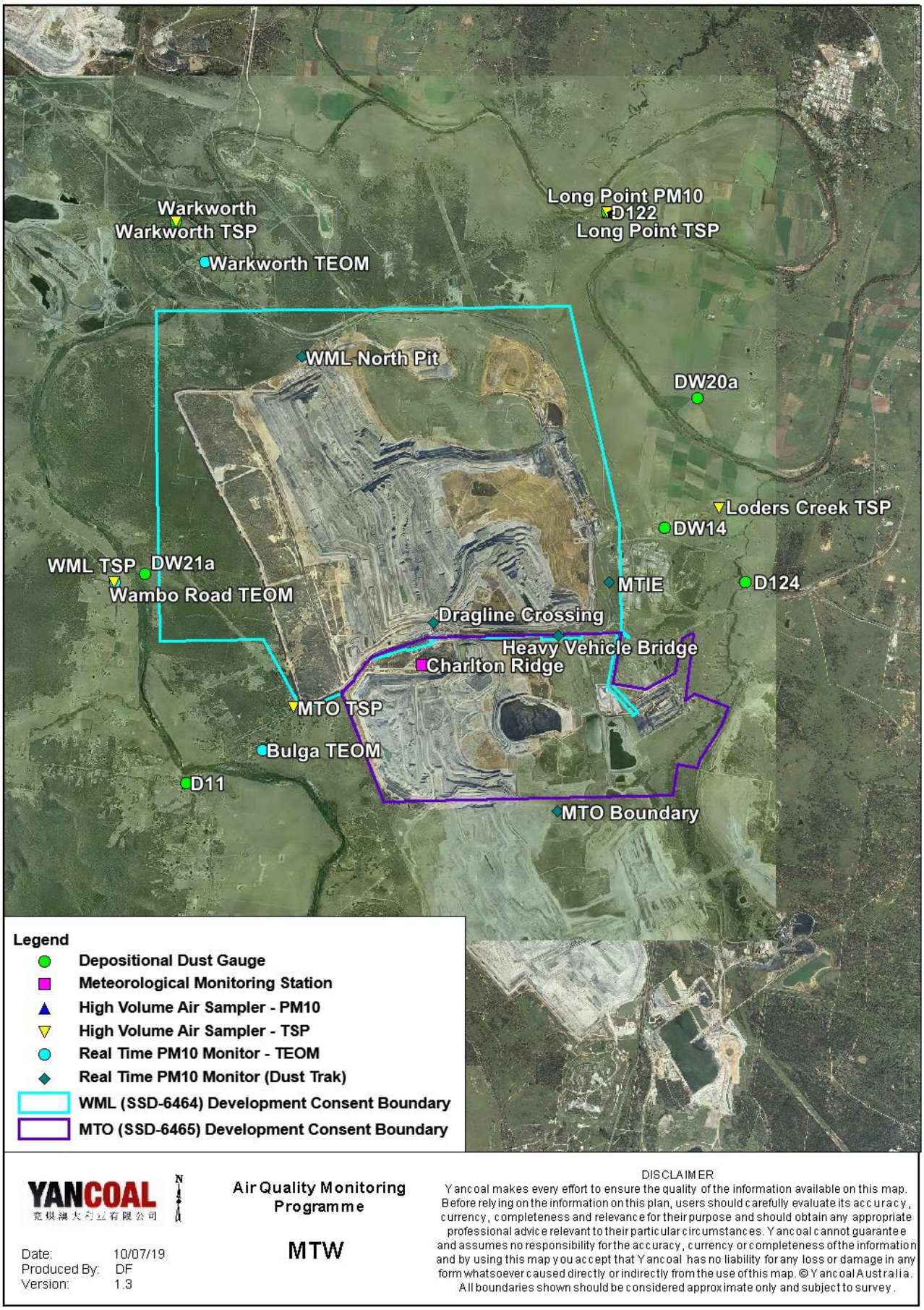


Figure 3: Air Quality Monitoring Locations

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. Accordingly, the result will be 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.

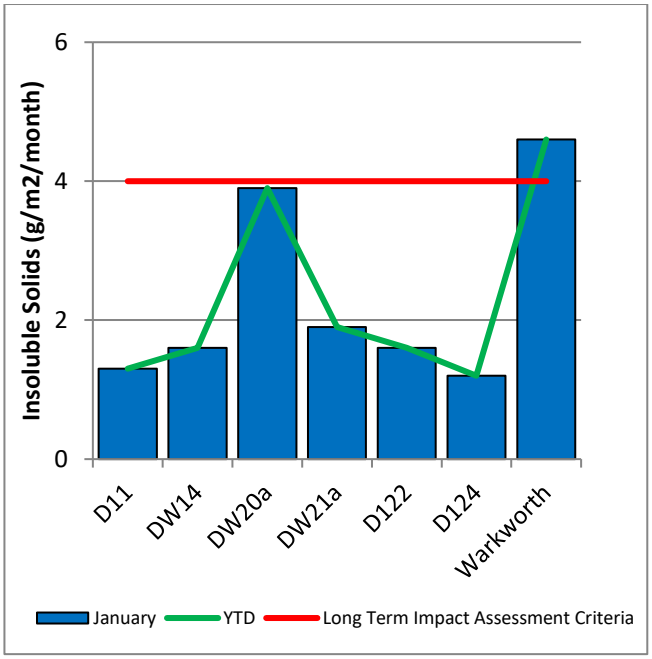


Figure 4: Depositional Dust – January 2021

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.

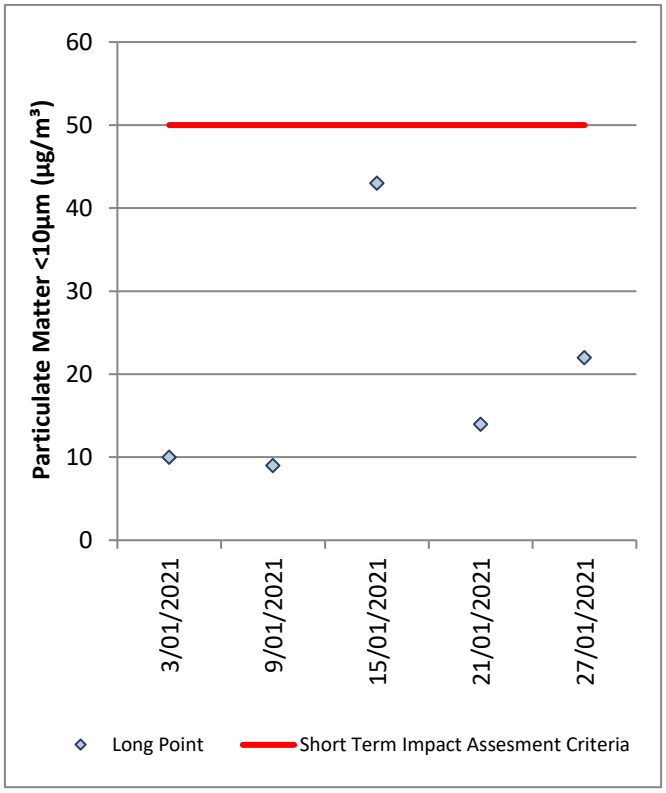


Figure 5: Individual PM10 Results – January 2021

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.

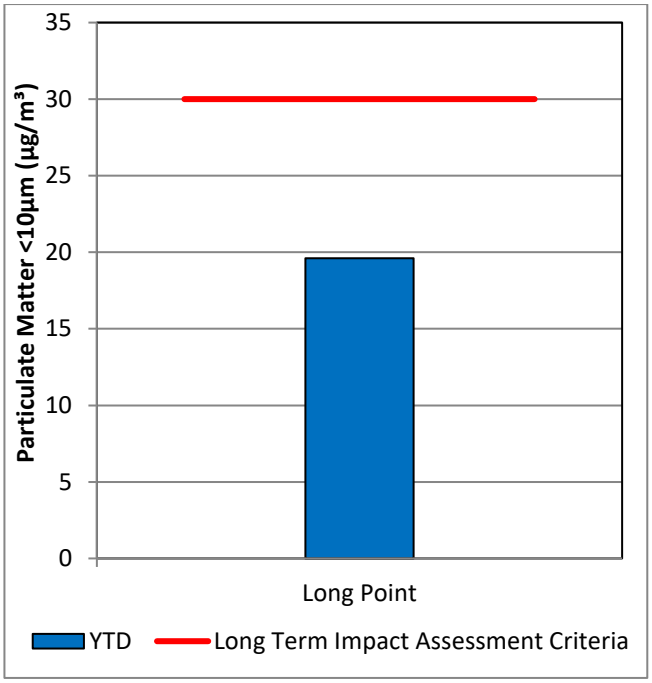


Figure 6: Annual Average PM_{10} – January 2021

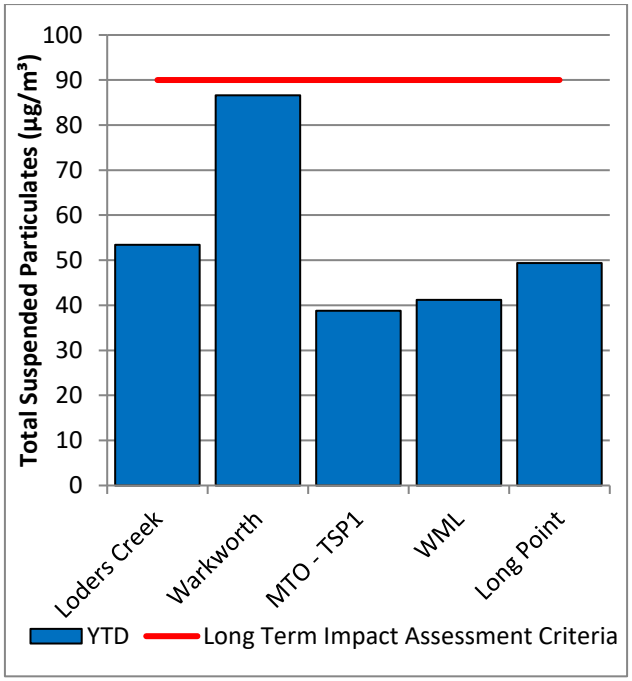


Figure 7: Annual Average Total Suspended Particulates – January 2021

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.

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.

Data was not available from 20 to 21 January from the Bulga monitor due to equipment issues.

2.3.4 Real Time Alarms for Air Quality

During January, the real time monitoring system generated 113 automated air quality related alerts, including 21 alerts for adverse meteorological conditions and 92 alerts for elevated PM_{10} levels

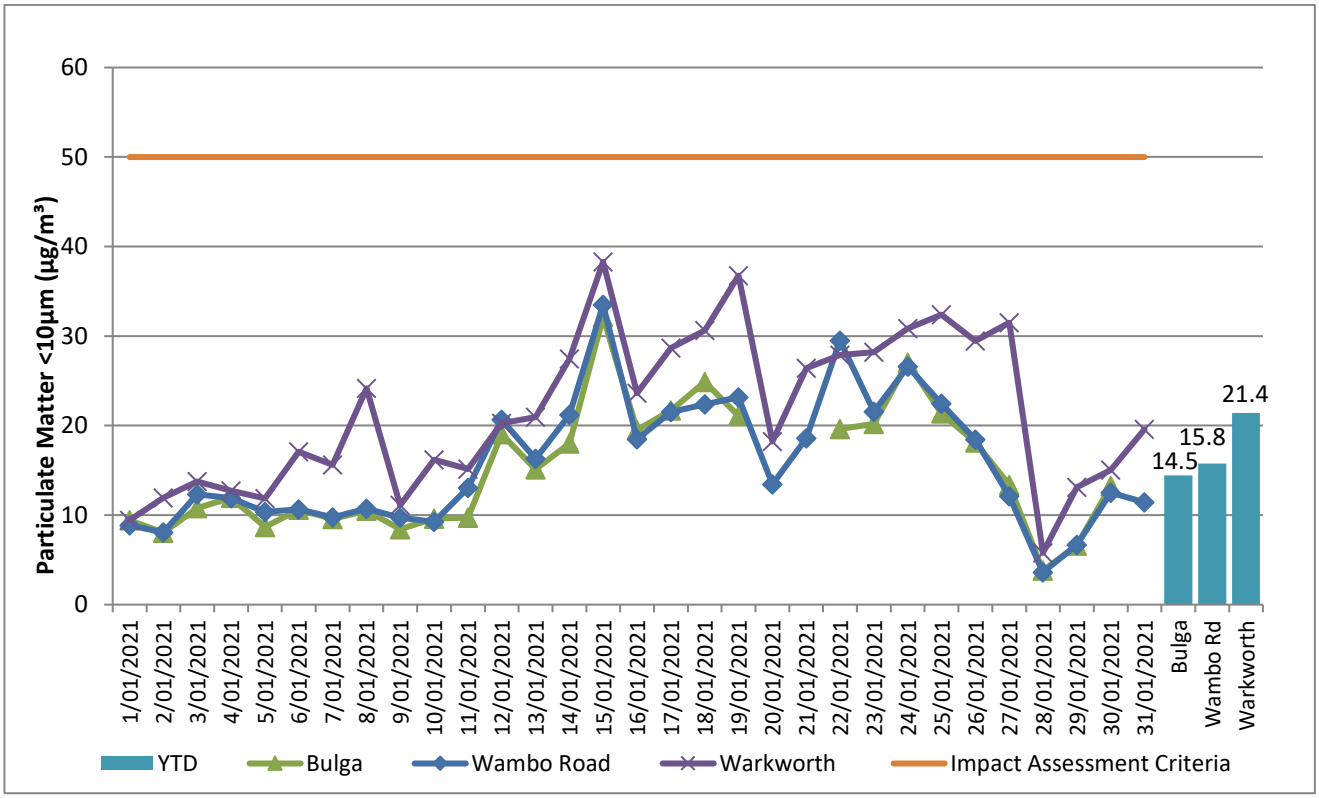


Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – January 2021

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 March 2021 report.

3.2 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 March 2021 report.

3.3 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 period no water was discharged under the HRSTS.

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 January 2021, 17 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 one blast exceeded the 115 dB(L) threshold for airblast overpressure at the Warkworth blast monitoring location. No blast exceeded the 5mm/s criteria for ground vibration.

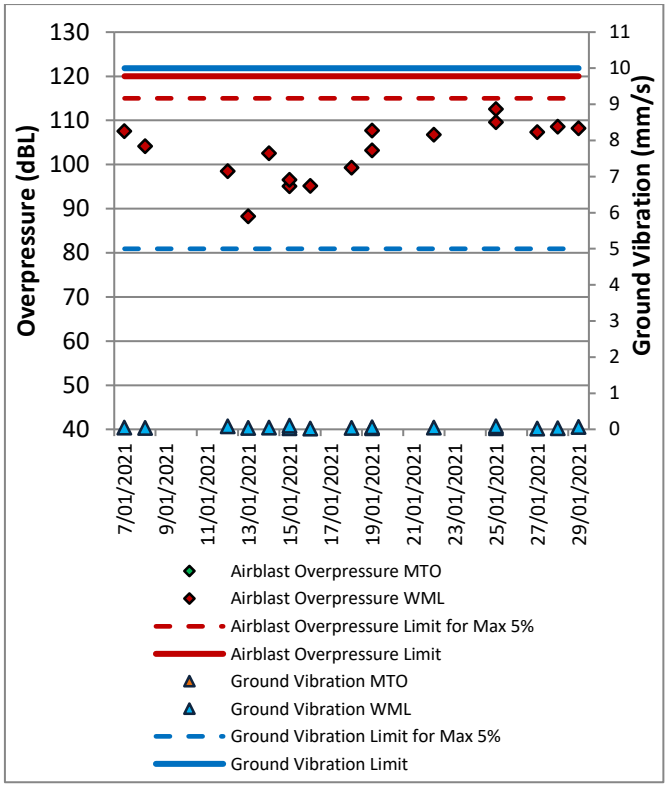


Figure 9: Abbey Green Blast Monitoring Results – January 2021

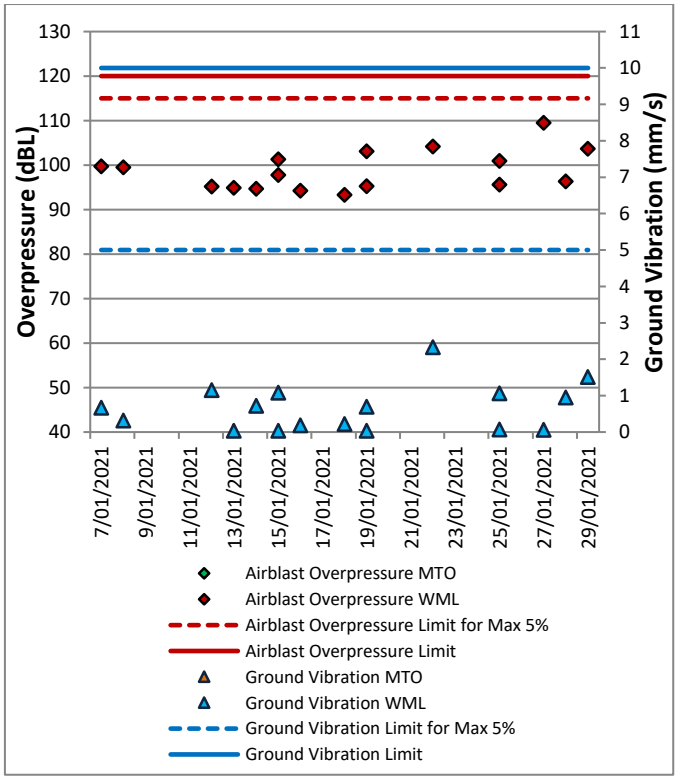


Figure 10: Bulga Village Blast Monitoring Results – January 2021

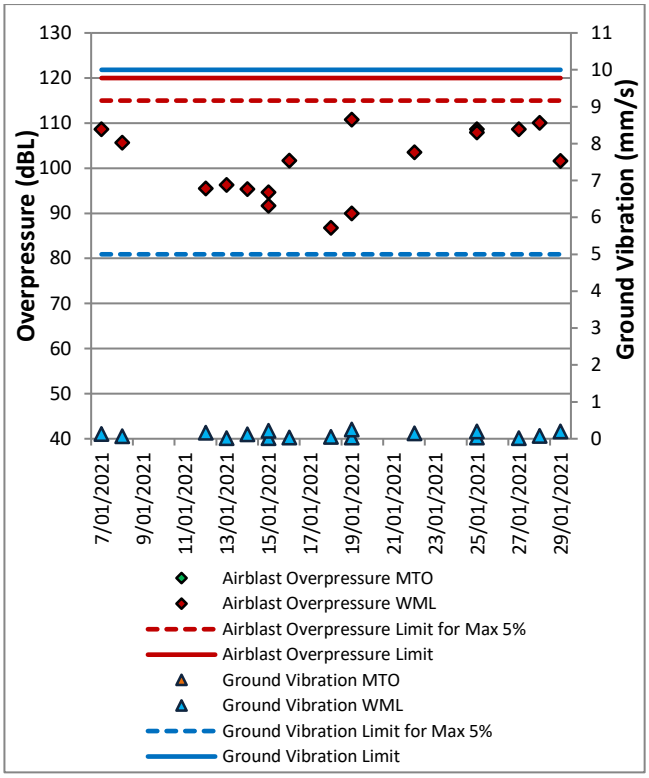


Figure 11: MTIE Blast Monitoring Results – January 2021

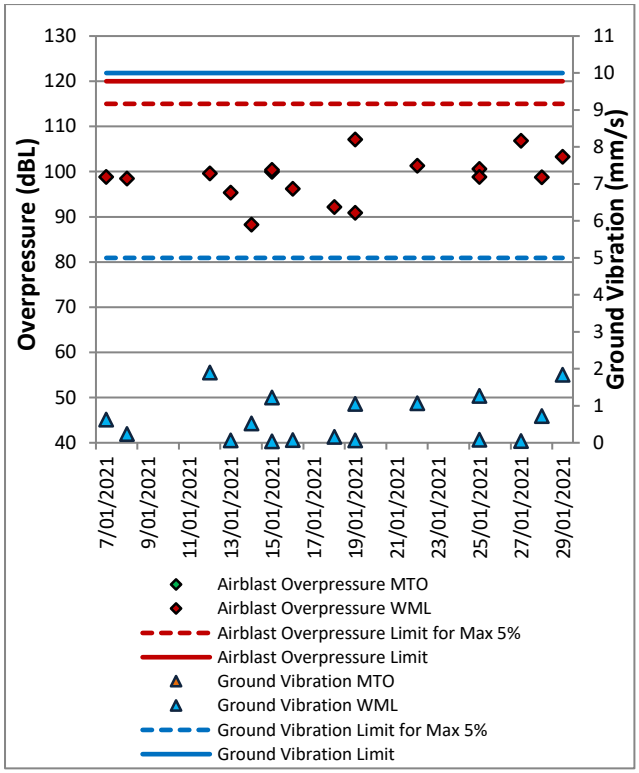


Figure 13: Wambo Road Blast Monitoring Results – January 2021

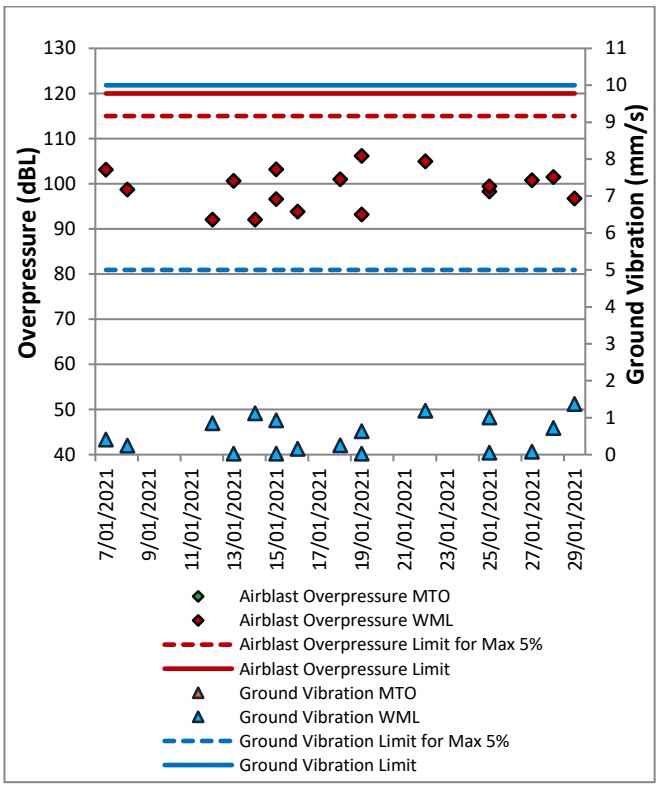


Figure 12: Wollemi Peak Road Blast Monitoring Results – January 2021

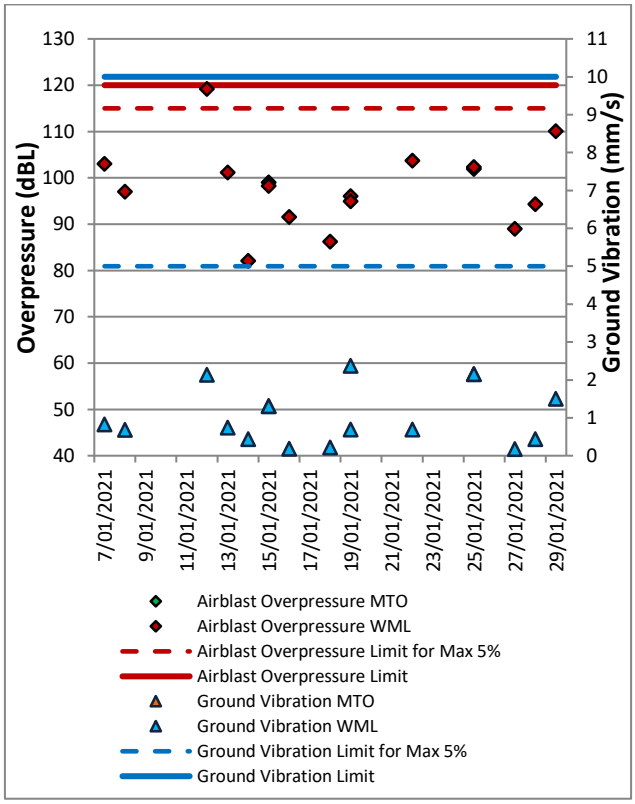


Figure 14: Warkworth Blast Monitoring Results – January 2021

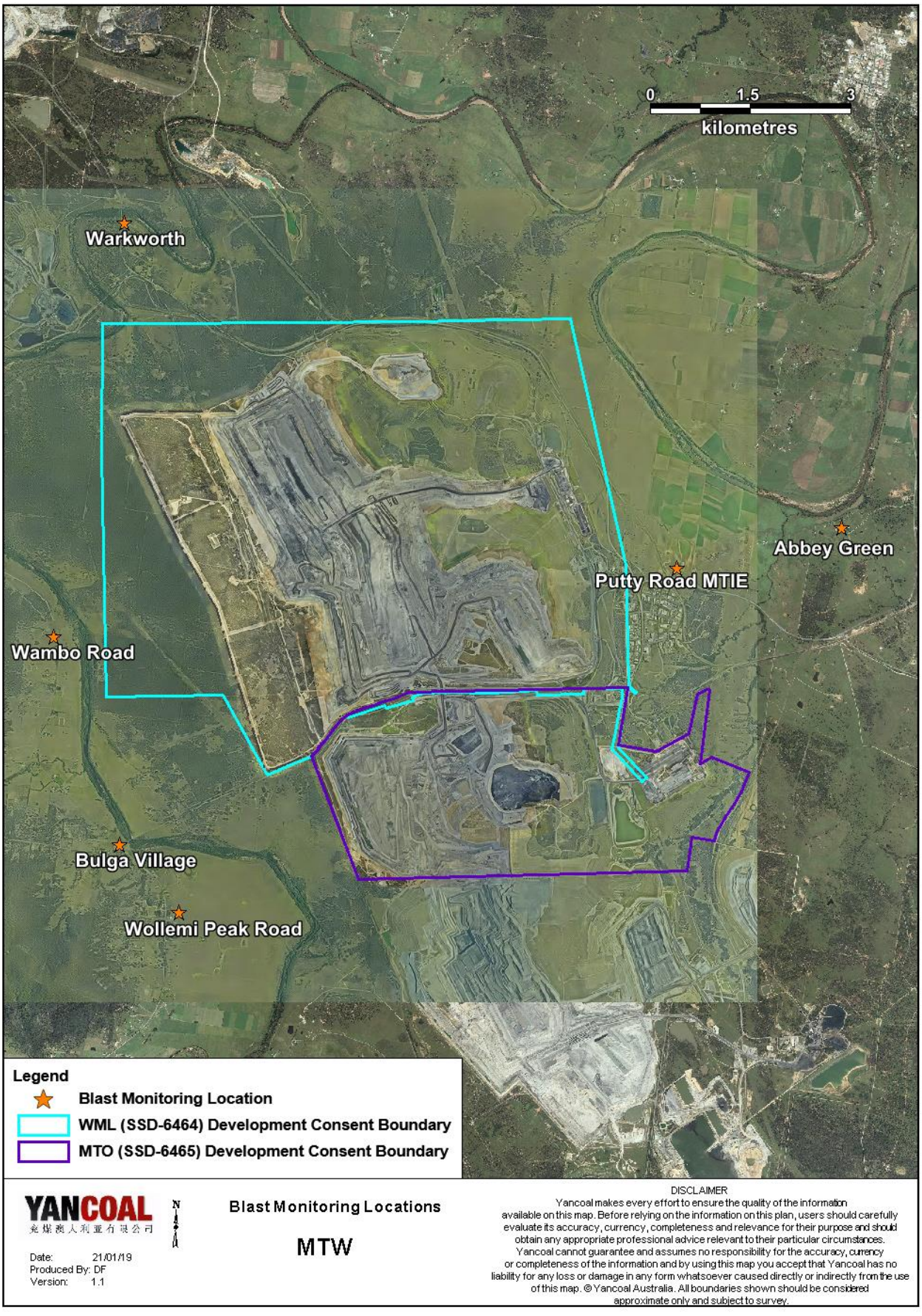


Figure 16: MTW Blast Monitoring Location Plan

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 17**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 14 January 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 –January 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	14/01/2021 22:59	4.2	D	37	No	<25	NA
Bulga Village	14/01/2021 22:14	3.1	E	38	No	29	NA
Gouldsville	14/01/2021 21:23	1.7	F	38	Yes	IA	Nil
Inlet Rd	14/01/2021 21:26	1.7	F	37	Yes	IA	Nil
Inlet Rd West	14/01/2021 21:01	1.2	F	35	Yes	IA	Nil
Long Point	14/01/2021 21:00	1.2	F	35	Yes	IA	Nil
South Bulga	14/01/2021 23:22	5.7	D	35	No	IA	NA
Wambo Road	14/01/2021 21:50	2.1	F	38	No	IA	NA

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.

Table 4: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – January 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	14/01/2021 22:59	4.2	D	47	No	<25	NA
Bulga Village	14/01/2021 22:14	3.1	E	48	No	33	NA
Gouldsville	14/01/2021 21:23	1.7	F	48	Yes	IA	Nil
Inlet Rd	14/01/2021 21:26	1.7	F	47	Yes	IA	Nil
Inlet Rd West	14/01/2021 21:01	1.2	F	45	Yes	IA	Nil
Long Point	14/01/2021 21:00	1.2	F	45	Yes	IA	Nil
South Bulga	14/01/2021 23:22	5.7	D	45	No	IA	NA
Wambo Road	14/01/2021 21:50	2.1	F	48	No	IA	NA

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 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.

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 – January 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	14/01/2021 22:59	4.2	D	37	No	IA	NA
Bulga Village	14/01/2021 22:14	3.1	E	38	No	IA	NA
Gouldsville	14/01/2021 21:23	1.7	F	35	Yes	IA	Nil
Inlet Rd	14/01/2021 21:26	1.7	F	37	Yes	IA	Nil
Inlet Rd West	14/01/2021 21:01	1.2	F	35	Yes	IA	Nil
Long Point	14/01/2021 21:00	1.2	F	35	Yes	IA	Nil
South Bulga	14/01/2021 23:22	5.7	D	36	No	IA	NA
Wambo Road	14/01/2021 21:50	2.1	F	38	No	IA	NA

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;
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 – January 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	14/01/2021 22:59	4.2	D	47	No	IA	NA
Bulga Village	14/01/2021 22:14	3.1	E	48	No	IA	NA
Gouldsville	14/01/2021 21:23	1.7	F	45	Yes	IA	Nil
Inlet Rd	14/01/2021 21:26	1.7	F	47	Yes	IA	Nil
Inlet Rd West	14/01/2021 21:01	1.2	F	45	Yes	IA	Nil
Long Point	14/01/2021 21:00	1.2	F	45	Yes	IA	Nil
South Bulga	14/01/2021 23:22	5.7	D	46	No	IA	NA
Wambo Road	14/01/2021 21:50	2.1	F	48	No	IA	NA

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;
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 – January 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	14/01/2021 22:59	<25	NA	No	No	NA	No	NA	Nil	NA
Bulga Village	14/01/2021 22:14	29	NA	No	No	NA	No	NA	Nil	NA
Gouldsville	14/01/2021 21:23	IA	Nil	No	No	NA	No	NA	Nil	NA
Inlet Rd	14/01/2021 21:26	IA	Nil	No	No	NA	No	NA	Nil	NA
Inlet Rd West	14/01/2021 21:01	IA	Nil	No	No	NA	No	NA	Nil	NA
Long Point	14/01/2021 21:00	IA	Nil	No	No	NA	No	NA	Nil	NA
South Bulga	14/01/2021 23:22	IA	NA	No	No	NA	No	NA	Nil	NA
Wambo Road	14/01/2021 21:50	IA	NA	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 – January 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	14/01/2021 22:59	IA	NA	No	No	NA	No	NA	Nil	NA
Bulga Village	14/01/2021 22:14	IA	NA	No	No	NA	No	NA	Nil	NA
Gouldsville	14/01/2021 21:23	IA	Nil	No	No	NA	No	NA	Nil	NA
Inlet Rd	14/01/2021 21:26	IA	Nil	No	No	NA	No	NA	Nil	NA
Inlet Rd West	14/01/2021 21:01	IA	Nil	No	No	NA	No	NA	Nil	NA
Long Point	14/01/2021 21:00	IA	Nil	No	No	NA	No	NA	Nil	NA
South Bulga	14/01/2021 23:22	IA	NA	No	No	NA	No	NA	Nil	NA
Wambo Road	14/01/2021 21:50	IA	NA	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.

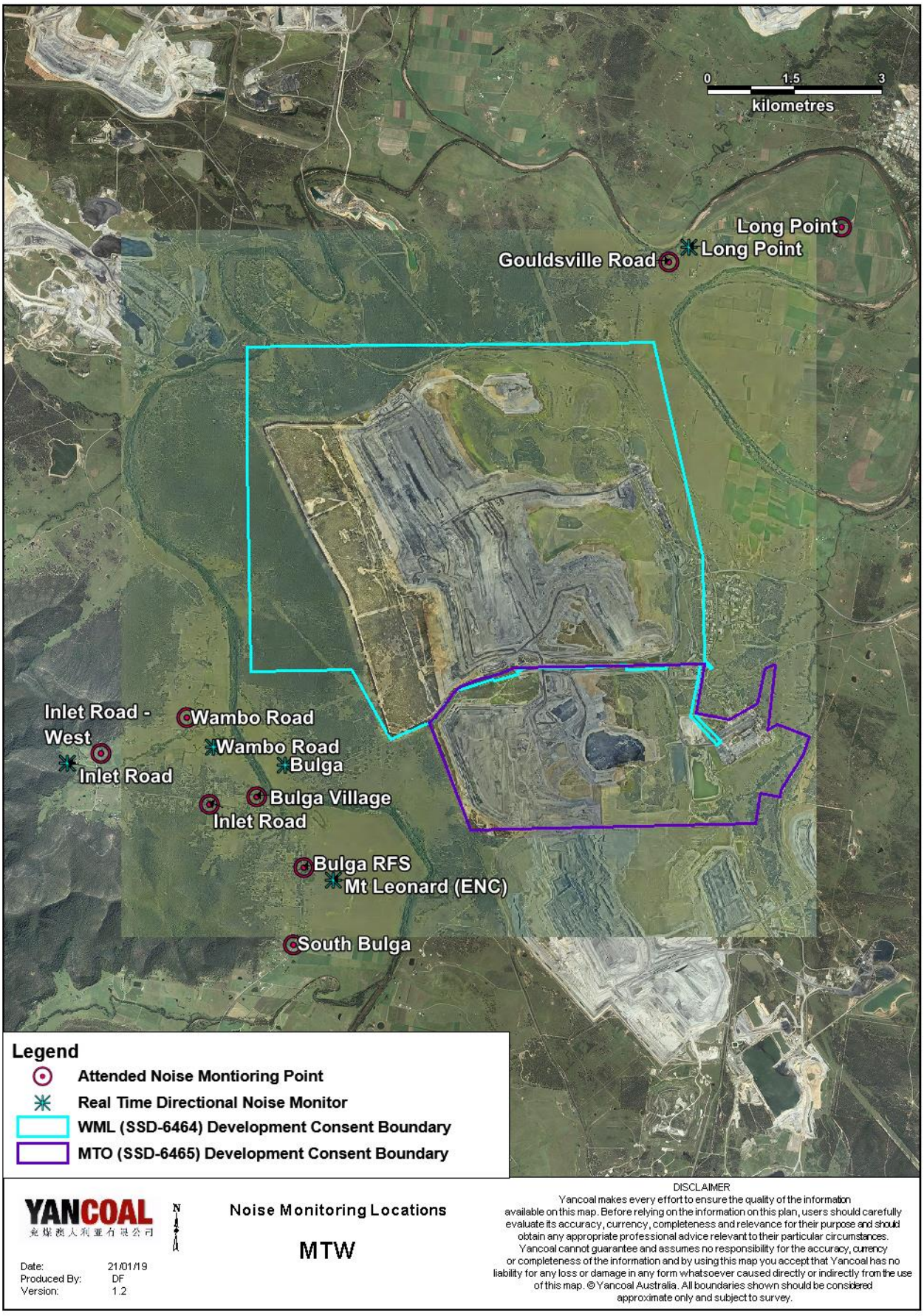


Figure 17: Noise Monitoring Location Plan

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 so as 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 January are provided in **Table 9**.

Table 9: Supplementary Attended Noise Monitoring Data – January 2021

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
654	3	3	0.46

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

6.0 OPERATIONAL DOWNTIME

During January, a total of 370 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**.

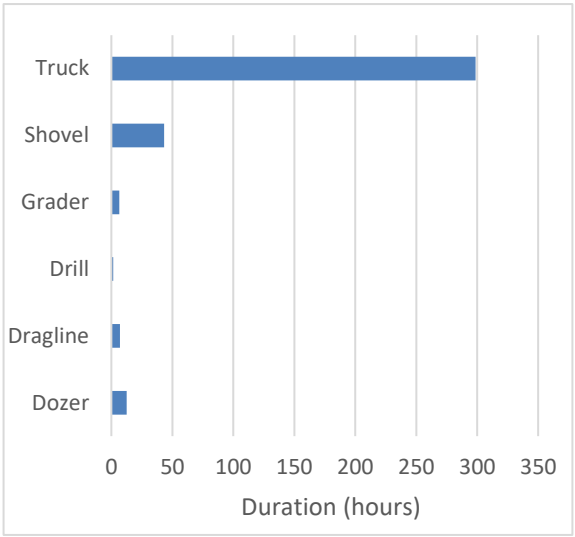


Figure 18: Operational Downtime by Equipment Type – January 2021

7.0 REHABILITATION

There was 6.2ha of bulk shaped area that was carried over from 2020 that will contribute towards the 2021 target.

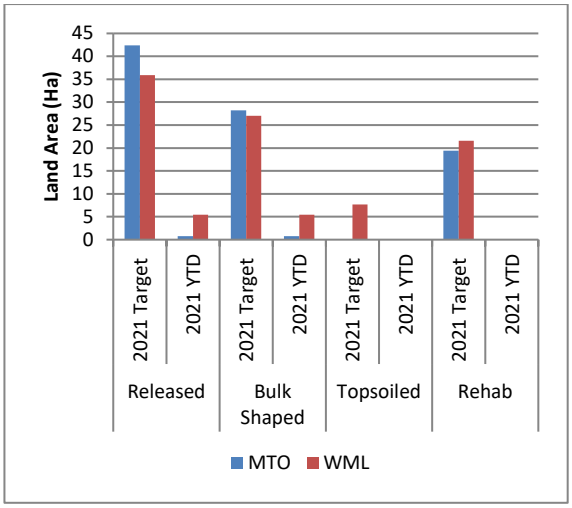


Figure 19: Rehabilitation YTD – January 2021

8.0 ENVIRONMENTAL INCIDENTS

There was one reportable environmental incident during the reporting period.

On 4 January 2021, multiple dams overtopped their spillways due to a high intensity rainfall event. A total of 79.4mm of rainfall was recorded during the rain event, with greater than 65mm of rainfall recorded within a two hour period on the afternoon of 4 January. Notifications to the relevant regulatory authorities were undertaken by the MTW Acting Environment and Community Manager in accordance with the sites Pollution Incident Response Management Plan.

9.0 COMPLAINTS

12 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						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						
Total	1	0	6	4	1	12

Appendix A: Meteorological Data

Table 11: Meteorological Data – Charlton Ridge Meteorological Station – January 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)
1/01/2021	20	13	100	86	160	4.3	6.4
2/01/2021	21	12	100	85	160	3.9	2.8
3/01/2021	28	15	100	60	122	1.5	1.6
4/01/2021	29	15	100	65	228	2.1	79.4
5/01/2021	31	13	100	41	271	2.4	0.0
6/01/2021	25	15	100	70	147	3.7	2.0
7/01/2021	24	14	100	59	149	4.4	1.6
8/01/2021	24	12	100	47	151	4.8	0.0
9/01/2021	24	12	100	61	130	3.1	9.4
10/01/2021	28	11	100	41	138	2.5	0.0
11/01/2021	30	12	100	32	130	2.4	0.0
12/01/2021	33	14	100	34	158	1.7	0.0
13/01/2021	31	15	100	36	122	2.5	0.0
14/01/2021	36	14	100	31	247	3.4	0.0
15/01/2021	35	19	100	19	222	3.4	0.0
16/01/2021	29	14	57	13	198	3.4	0.0
17/01/2021	30	10	83	24	190	2.2	0.0
18/01/2021	32	14	98	23	220	2.6	0.0
19/01/2021	29	14	90	43	178	3.3	0.0
20/01/2021	24	15	73	46	108	3.3	0.0
21/01/2021	30	10	90	27	143	2.3	0.0
22/01/2021	35	12	92	26	227	2.6	0.0
23/01/2021	37	17	75	20	224	2.5	0.0
24/01/2021	38	19	80	17	152	1.8	0.0
25/01/2021	38	16	80	13	206	2.1	0.0
26/01/2021	38	18	86	23	261	2.8	0.0
27/01/2021	30	18	86	43	161	5.7	0.0
28/01/2021	22	14	96	76	159	5.6	1.6
29/01/2021	26	15	99	69	132	3.6	1.2
30/01/2021	29	17	95	47	161	1.6	0.0
31/01/2021	28	15	97	57	179	3.7	0.0

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