Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

February 2020

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Revision History

Version No.	Version Details	Document Status	Date
1.0	**Environmental Advisor**	**Final**	**23/04/2020**

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 February to 29 February 2020.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

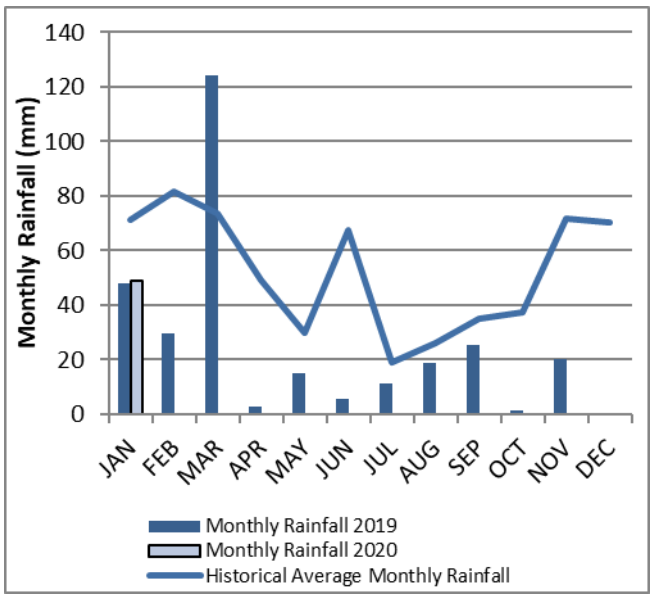
Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

2.1.1 Rainfall

Rainfall for the reporting period is summarised in **Table 1**. The year-to-date monthly rainfall totals, 2020 monthly rainfall totals and historical average monthly rainfall trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2020	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
February	135.8	184.8



Note: The historical average monthly rainfall is calculated from 2007 to 2019 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.**

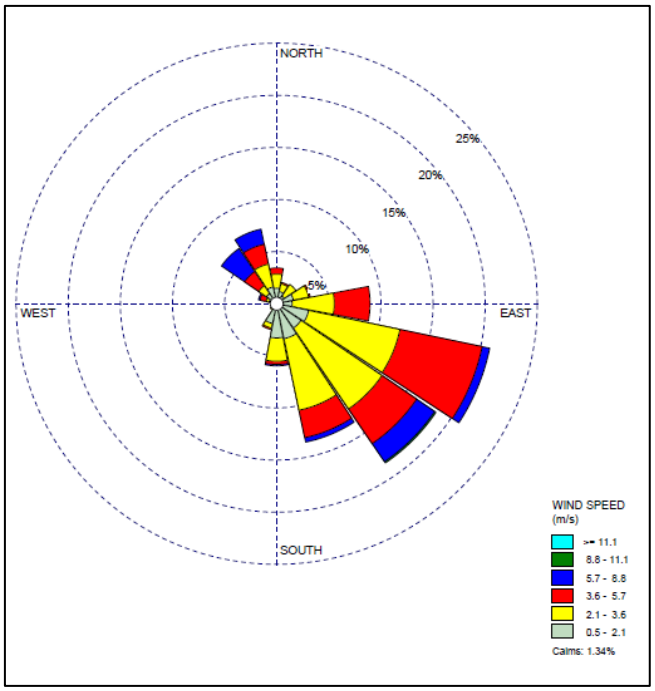


Figure 2: Charlton Ridge Wind Rose – February 2020

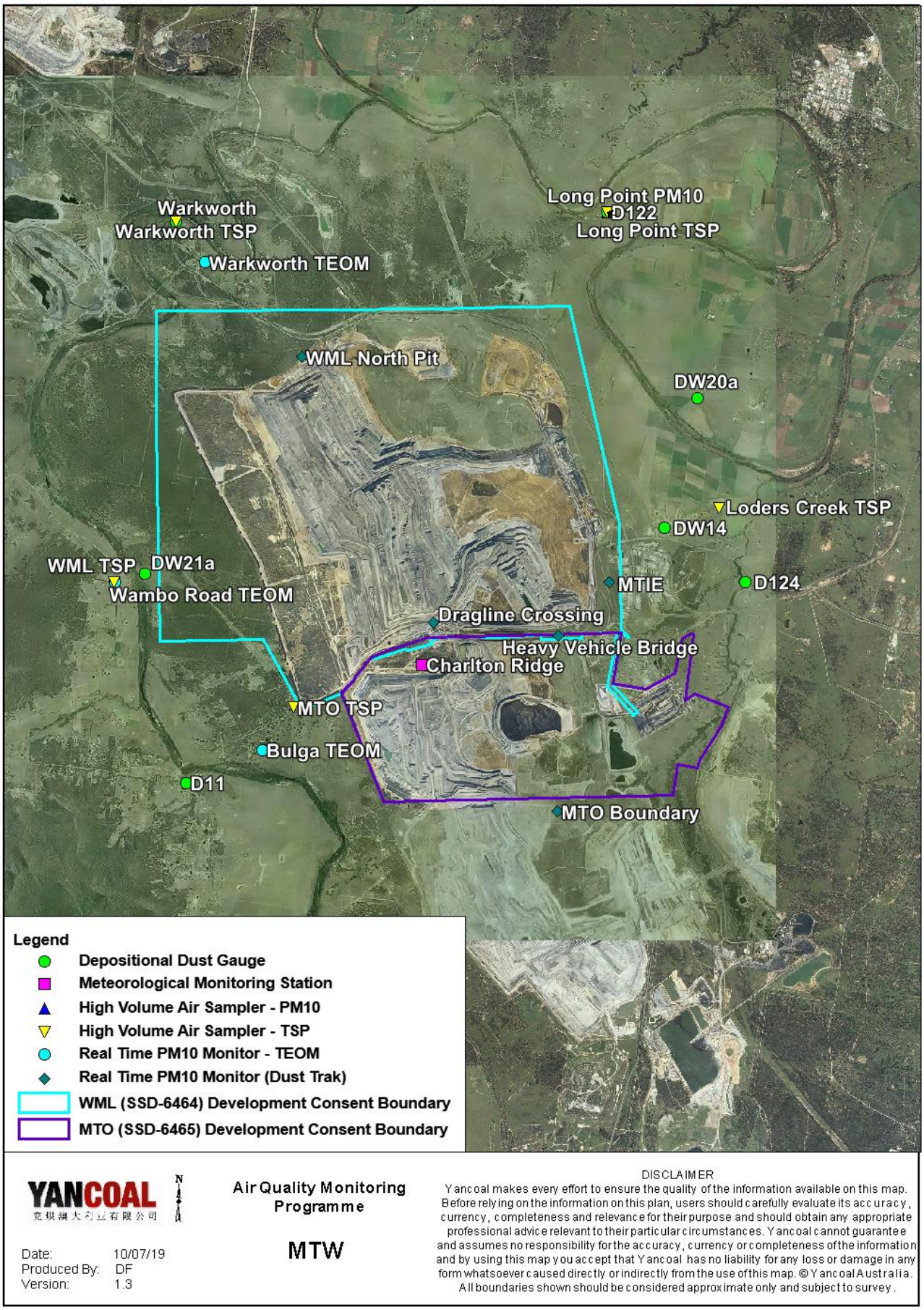


Figure 3: Air Quality Monitoring Locations

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.

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.

During the reporting period the D11, D122, D124 and Warkworth monitors recorded monthly results above the long-term impact assessment criteria of 4.0 g/m^2 per month. There is insufficient evidence to confirm that the D11, D122, D124 and Warkworth results are contaminated. Accordingly, the results will be included in the annual average calculation.

An annual assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2020 Annual Review Report.

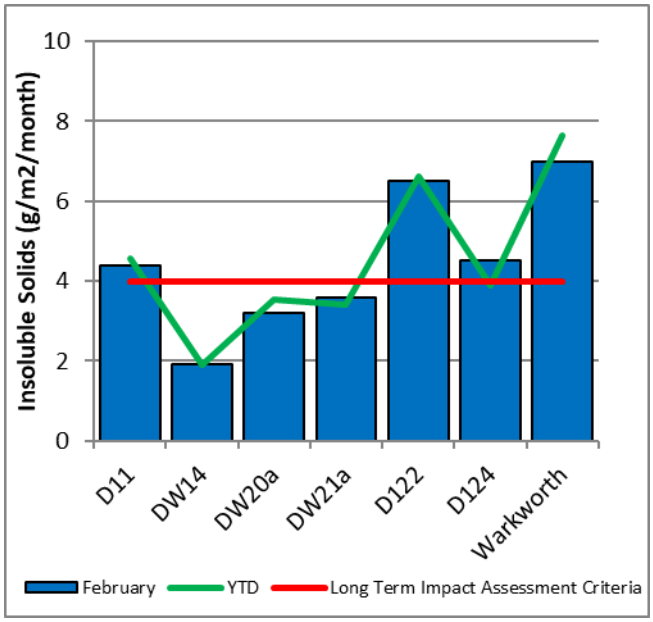


Figure 4: Depositional Dust – February 2020

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.

On 2 February 2020 the Long Point HVAS PM_{10} unit recorded a result of 56 µg/m^3, which is greater than the short term (24hr) PM_{10} impact assessment criteria.

Investigation determined that the wind direction was generally not from MTW's angle of influence and that the likely MTW contribution to the results is less than 75%. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

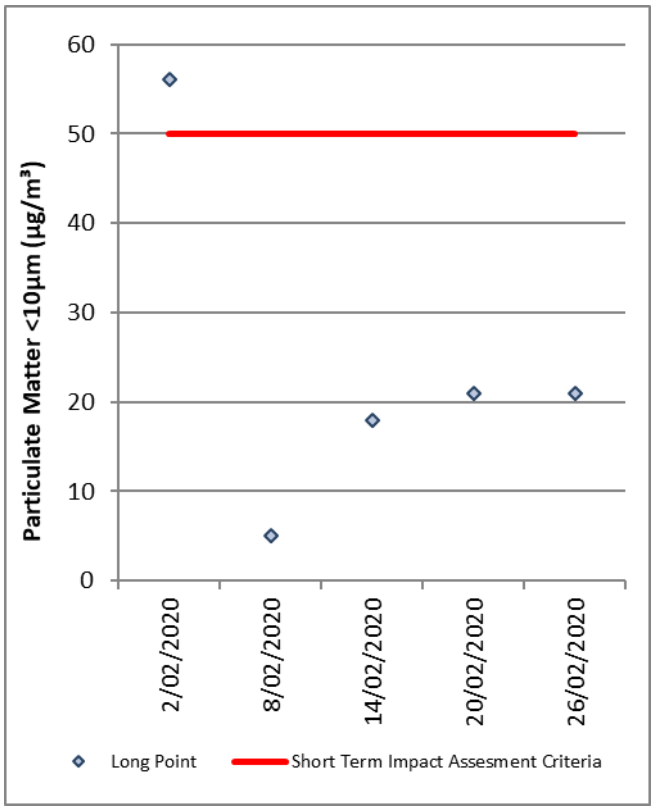


Figure 5: Individual PM10 Results – February 2020

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

An assessment of MTW's contribution to the long term assessment criteria will be reported in the 2020 Annual Review Report.

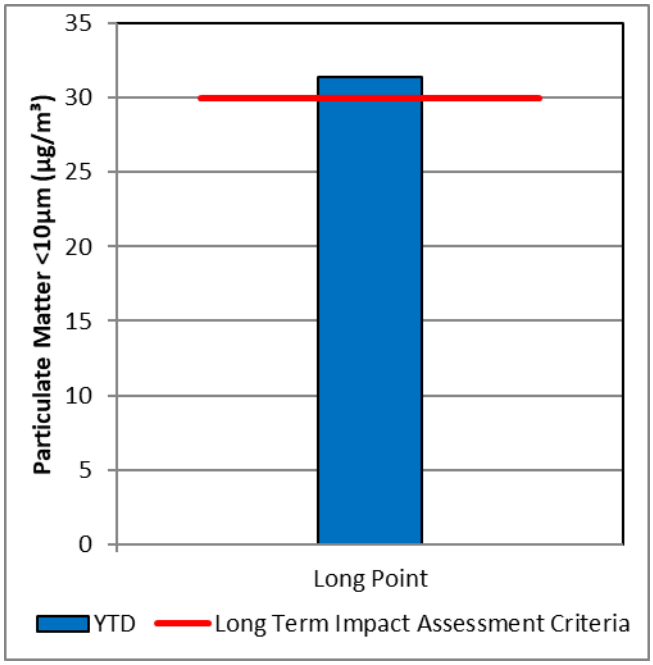


Figure 6: Annual Average PM_{10} – February 2020

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 contribution to the long-term assessment criteria will be reported in the 2020 Annual Review Report.

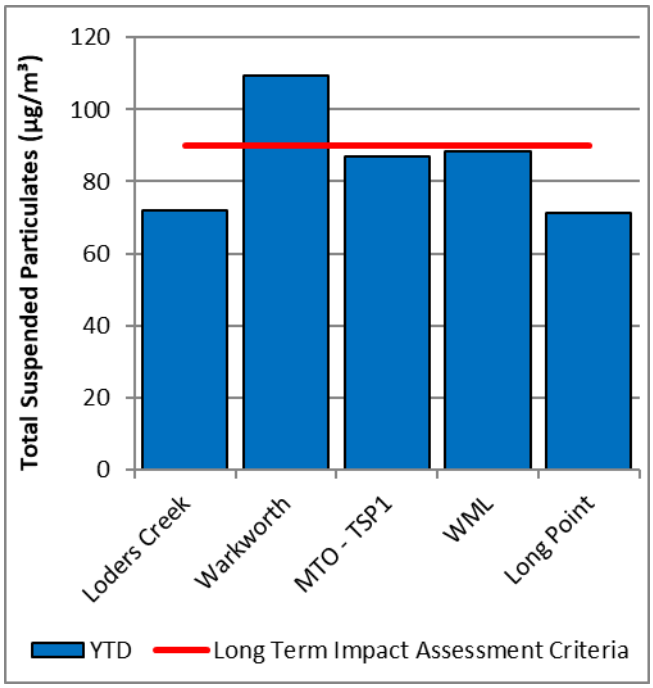


Figure 7: Annual Average Total Suspended Particulates – February 2020

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. It should be noted that the PM_{10} monitor named the "Wallaby Scrub Road TEOM" has been moved to a representative location west of Wollombi Brook and renamed "Wambo Road TEOM". This change to took effect from 1 February 2020. Please note: the year to date PM_{10} average result for the Wambo Road monitoring location has been calculated using data from the Wallaby Scrub Road TEOM for January 2020 and from the Wambo Road TEOM from February 2020 onwards.

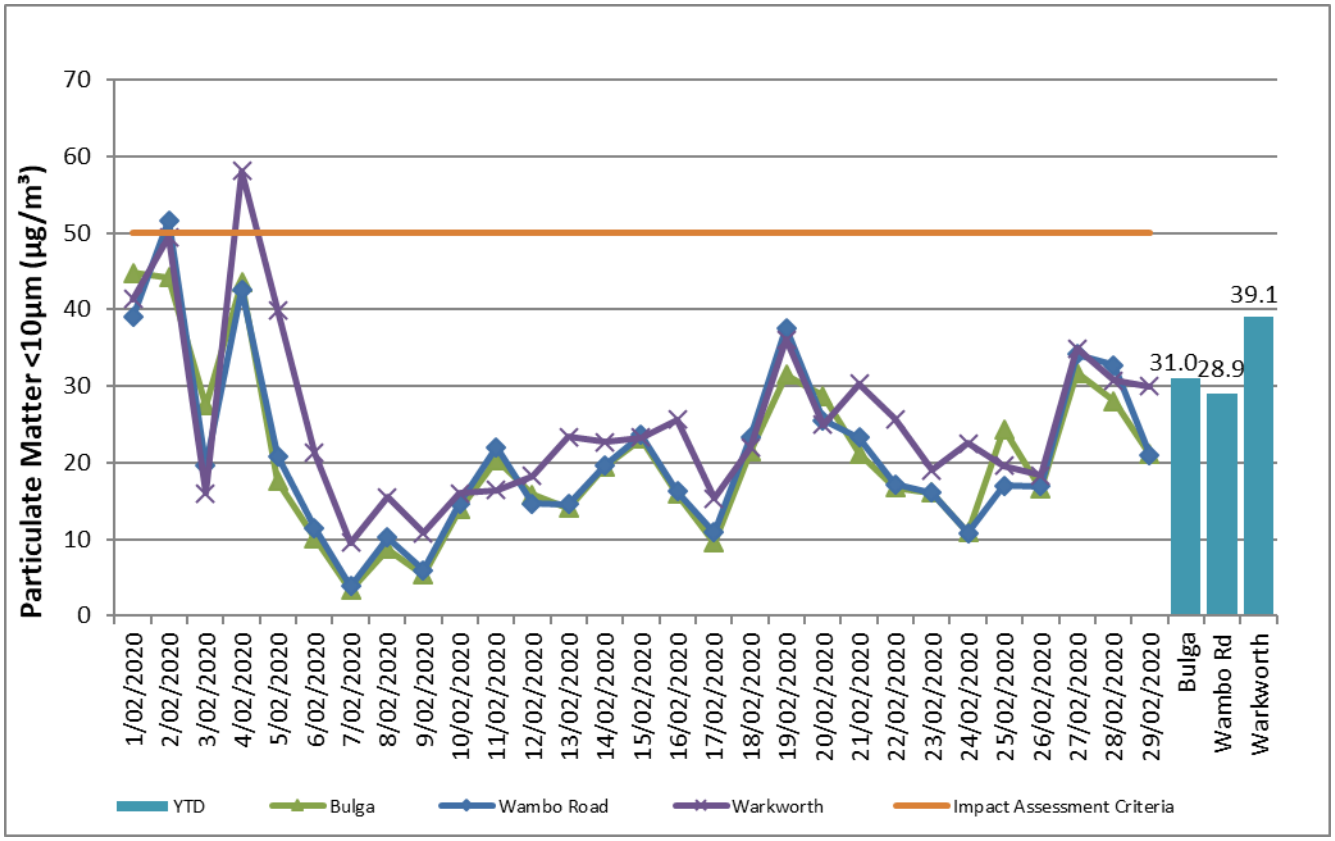
Results for real time dust sampling are shown in **Figure 8**, including the daily 24-hour average PM_{10} result and the annual PM_{10} average.

On 2 February 2020, the Wambo Road TEOM (51.7µg/m³) exceeded the short term (24hr) criteria. The measurement was assessed for MTW's potential contribution based on meteorological conditions on this day resulting in a maximum estimated contribution of 2.1µg/m³, less than a 5% contribution to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 4 February 2020, the Warkworth OEH TEOM (58.0µg/m³) exceeded the short term (24hr) criteria. The measurement was assessed for MTW's potential contribution based on meteorological conditions and background PM_{10} levels on this day resulting in a maximum estimated contribution of 13.3 µg/m³, less than a 23% contribution to the result. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

2.3.4 Real Time Alarms for Air Quality

During February, the real time monitoring system generated 174 automated air quality related alerts, including 31 alerts for adverse meteorological conditions and 143 alerts for elevated PM_{10} levels.



Note: The Year to Date (YTD) PM10 average result for the Wambo Road monitoring location has been calculated using data from the Wallaby Scrub Road TEOM location for January 2020 and from the Wambo Road TEOM from February 2020 onwards.

Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – February 2020

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 2020 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 2020 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 February 2020, 16 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
120	0%
Ground Vibration (mm/s)	**Comments**
5	5% of the total number of blasts in a 12 month period
10	0%

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

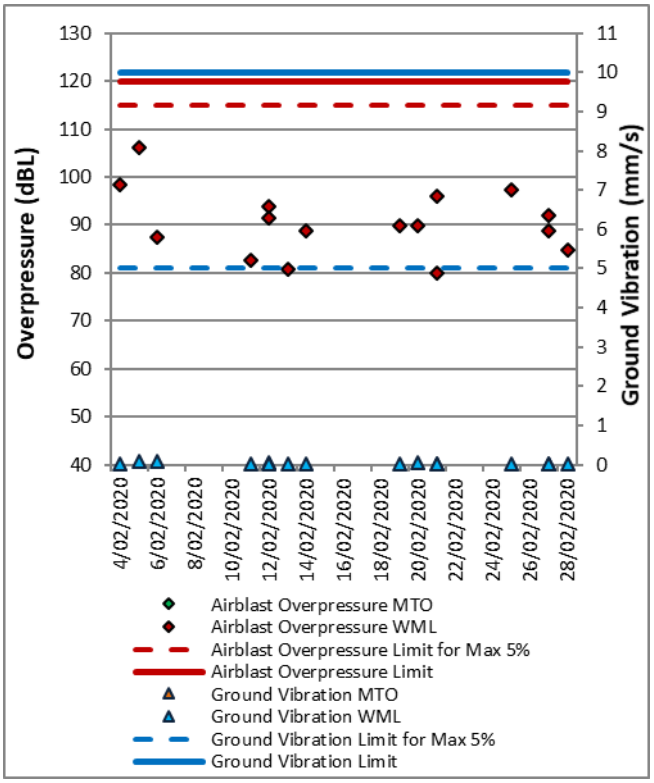


Figure 9: Abbey Green Blast Monitoring Results – February 2020

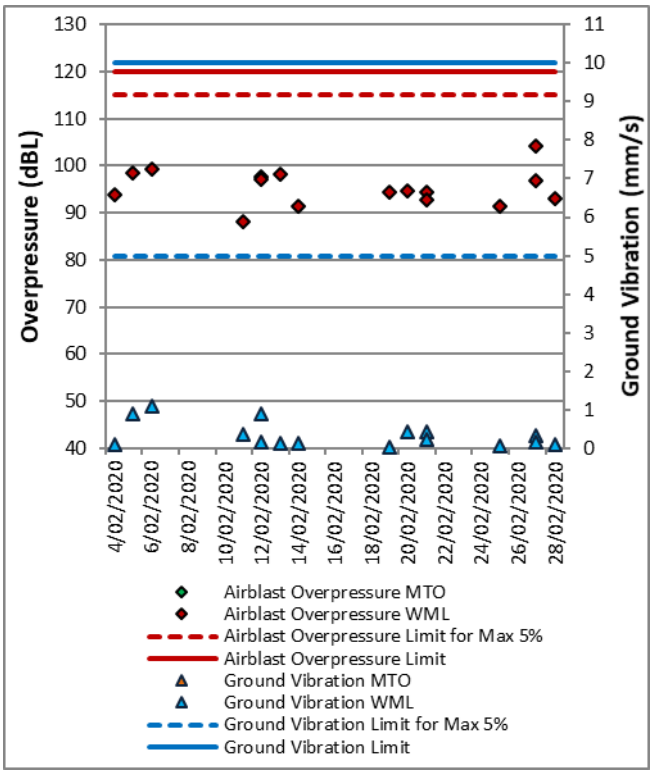


Figure 10: Bulga Village Blast Monitoring Results – February 2020

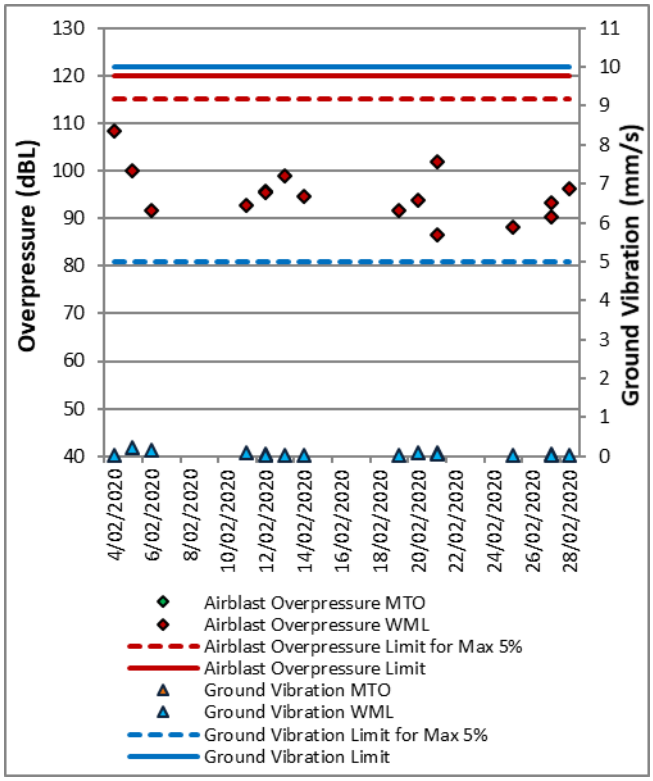


Figure 11: MTIE Blast Monitoring Results – February 2020

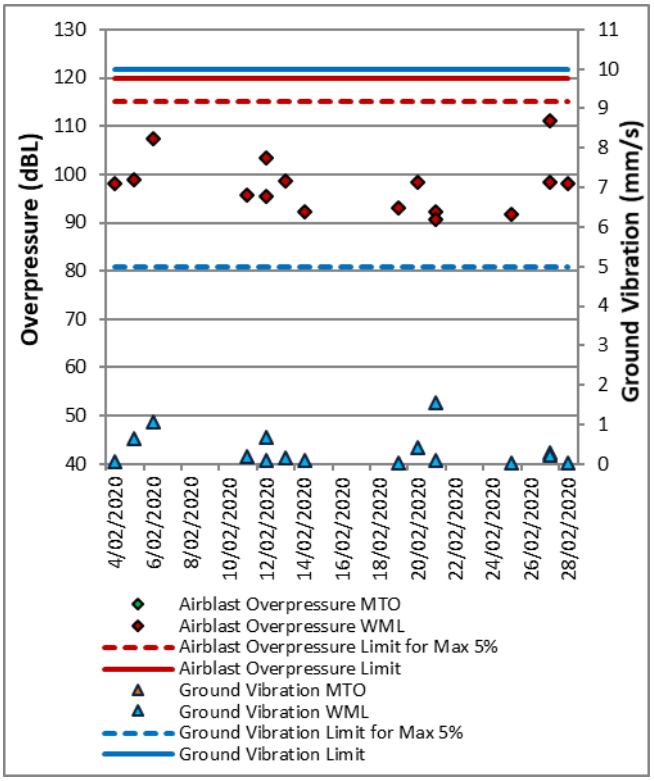


Figure 13: Wambo Road Blast Monitoring Results – February 2020

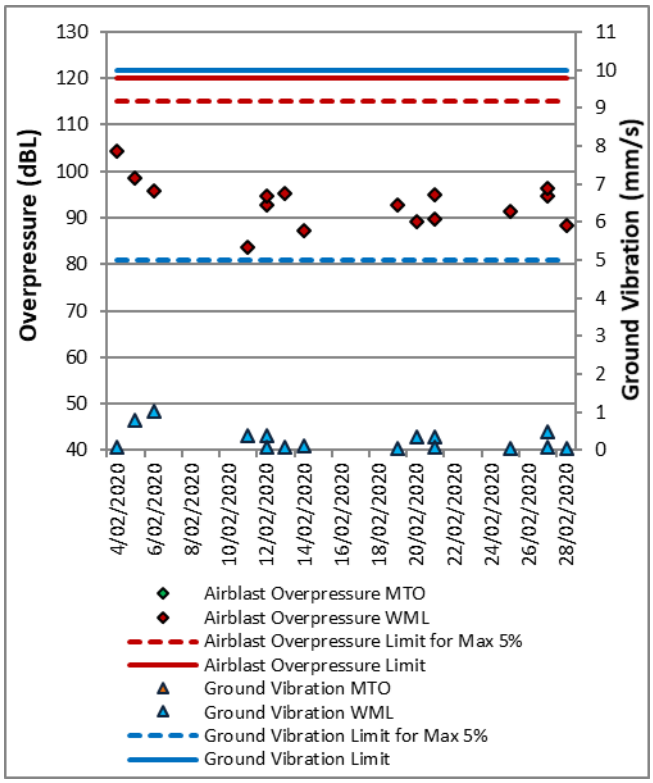


Figure 12: Wollemi Peak Road Blast Monitoring Results – February 2020

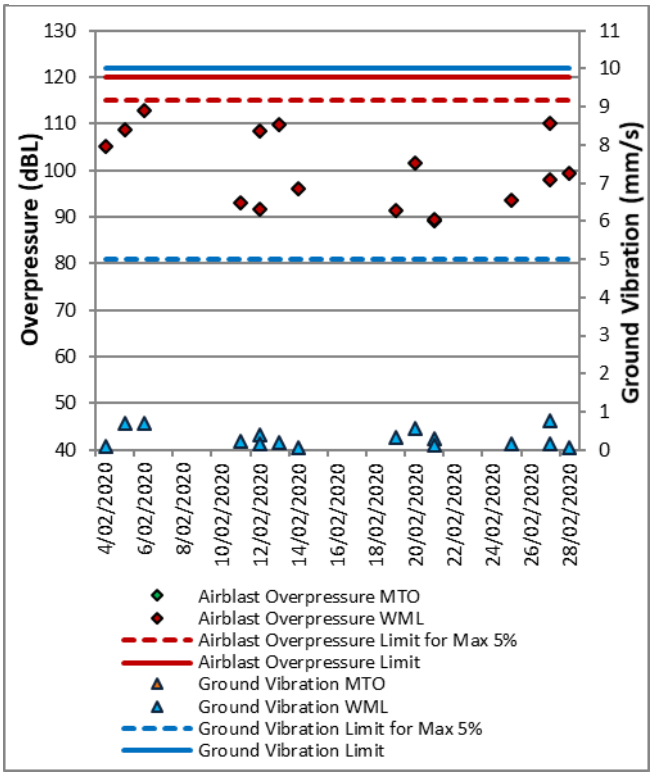


Figure 14: Warkworth Blast Monitoring Results – February 2020

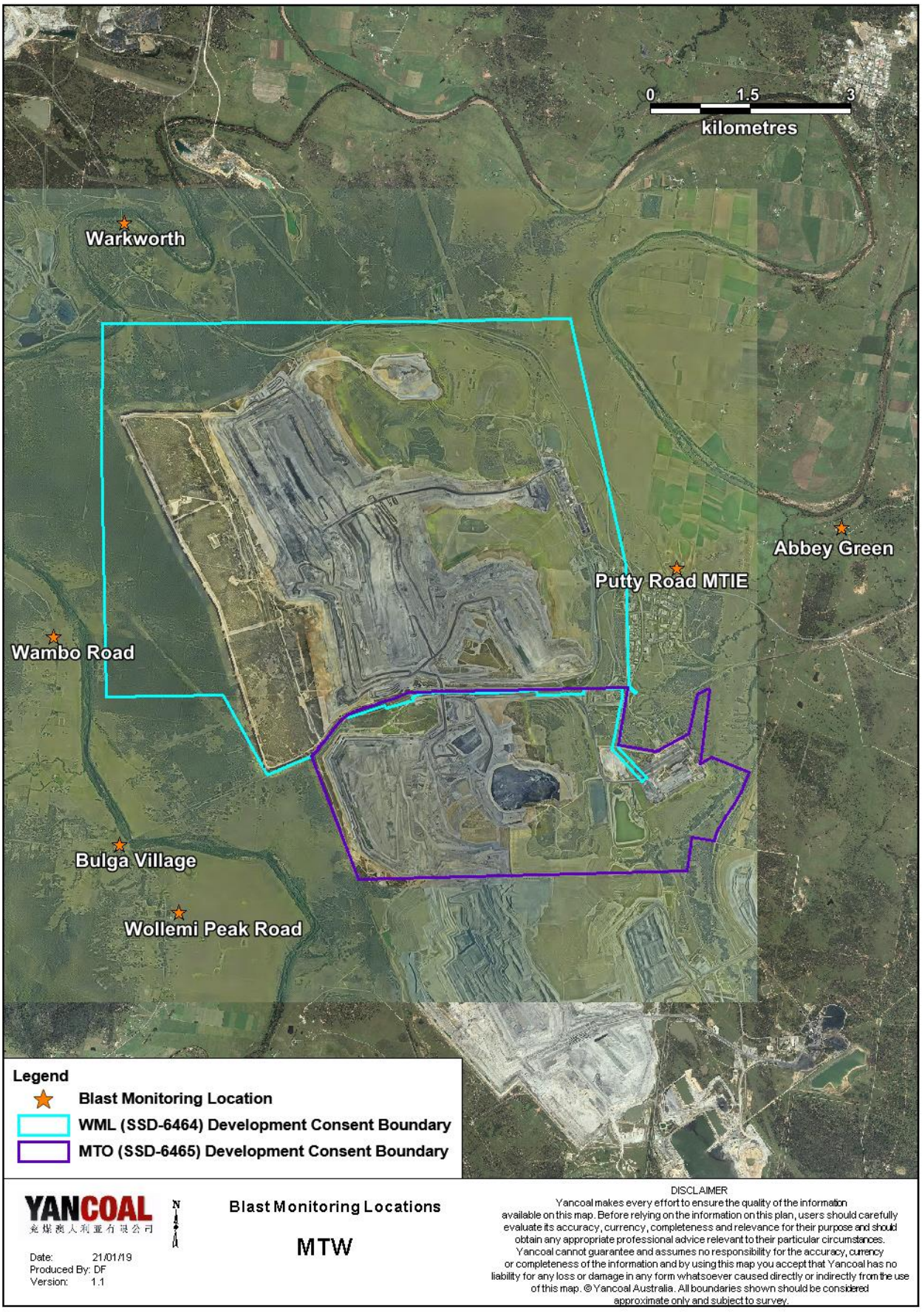


Figure 15: MTW Blast Monitoring Location Plan

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**.

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 19 February 2020. All measurements complied with the relevant criteria. Results are detailed in **Table 3 to Table 6.**

5.1 Attended Noise Monitoring Results

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 – February 2020

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML L_{Aeq} dB[2,3]	Exceedance[3,4]
Bulga RFS	19/02/2020 23:30	2.7	D	37	Yes	IA	Nil
Bulga Village	19/02/2020 23:16	2.8	D	38	Yes	IA	Nil
Gouldsville	19/02/2020 21:23	2.8	E	38	Yes	28	Nil
Inlet Rd	19/02/2020 21:26	2.8	E	37	Yes	IA	Nil
Inlet Rd West	19/02/2020 21:00	4.7	D	35	No	IA	NA
Long Point	19/02/2020 21:00	4.7	D	35	No	<20	NA
South Bulga	20/02/2020 0:21	2.3	F	35	No	IA	NA
Wambo Road	19/02/2020 21:52	2.8	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; and
4. 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 – February 2020

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB(A)	Criterion Applies?[1]	WML $L_{A1,\ 1min}$ dB[2,3]	Exceedance[3,4]
Bulga RFS	19/02/2020 23:30	2.7	D	47	Yes	IA	Nil
Bulga Village	19/02/2020 23:16	2.8	D	48	Yes	IA	Nil
Gouldsville	19/02/2020 21:23	2.8	E	48	Yes	30	Nil
Inlet Rd	19/02/2020 21:26	2.8	E	47	Yes	IA	Nil
Inlet Rd West	19/02/2020 21:00	4.7	D	45	No	IA	NA
Long Point	19/02/2020 21:00	4.7	D	45	No	<20	NA
South Bulga	20/02/2020 0:21	2.3	F	45	No	IA	NA
Wambo Road	19/02/2020 21:52	2.8	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 are possible exceedances of relevant criteria; and
4. 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 – February 2020

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3]	Exceedance[3,4]
Bulga RFS	19/02/2020 23:30	2.7	D	37	Yes	IA	Nil
Bulga Village	19/02/2020 23:16	2.8	D	38	Yes	IA	Nil
Gouldsville	19/02/2020 21:23	2.8	E	35	Yes	IA	Nil
Inlet Rd	19/02/2020 21:26	2.8	E	37	Yes	IA	Nil
Inlet Rd West	19/02/2020 21:00	4.7	D	35	No	IA	NA
Long Point	19/02/2020 21:00	4.7	D	35	No	IA	NA
South Bulga	20/02/2020 0:21	2.3	F	36	No	IA	NA
Wambo Road	19/02/2020 21:52	2.8	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; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was not applicable.

Table 6: $L_{A1, 1Minute}$ Mount Thorley - Impact Assessment Criteria – February 2020

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1, 1min}$ dB[2,3]	Exceedance[3,4]
Bulga RFS	19/02/2020 23:30	2.7	D	47	Yes	IA	Nil
Bulga Village	19/02/2020 23:16	2.8	D	48	Yes	IA	Nil
Gouldsville	19/02/2020 21:23	2.8	E	45	Yes	IA	Nil
Inlet Rd	19/02/2020 21:26	2.8	E	47	Yes	IA	Nil
Inlet Rd West	19/02/2020 21:00	4.7	D	45	No	IA	NA
Long Point	19/02/2020 21:00	4.7	D	45	No	IA	NA
South Bulga	20/02/2020 0:21	2.3	F	46	No	IA	NA
Wambo Road	19/02/2020 21:52	2.8	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; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in consent, therefore criterion was 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 a low frequency modification factor correction to be applied. The assessment for low frequency noise is shown in **Table 7**.

Table 7: Low Frequency Noise Modifying Factor Assessment – February 2020

Location	Date and Time	Measured Site Only LA_{eq} dB (WML/MTO)	Site Only L_{Ceq} dB[1] (WML/MTO)	Site Only LCeq – LAeq dB[1,2] (WML/MTO)	Result Max exceedance of ref spectrum dB (WML/MTO) [1,3]	Modifying Factor Correction dB(A)[1]	Exceedance
Bulga RFS	19/02/2020 23:30	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Bulga Village	19/02/2020 23:16	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Gouldsville	19/02/2020 21:23	28/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd	19/02/2020 21:26	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd West	19/02/2020 21:00	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Long Point	19/02/2020 21:00	<20/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
South Bulga	20/02/2020 0:21	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Wambo Road	19/02/2020 21:52	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA

Notes:

1. Where it is not possible to determine the site-only result due to the presence of other low-frequency noise sources occurring during the measurement, or where criteria were not applicable due to meteorological conditions, or where site-only contributions were more than 5 dB less than the relevant LAeq criterion this is noted as NA (not available) and no further assessment has been undertaken;

2. As per NPfI, if LCeq – LAeq ≥ 15 dB further assessment of low-frequency noise required as detailed in Sections 2.5 and 3.3 of this report;

3. As per NPfI, compare measured spectrum against reference spectrum to determine if the low-frequency modifying factor is triggered and application of penalty is required; and

4. Bold results indicate that NPfI low-frequency modifying factor has been triggered and application of correction is required.

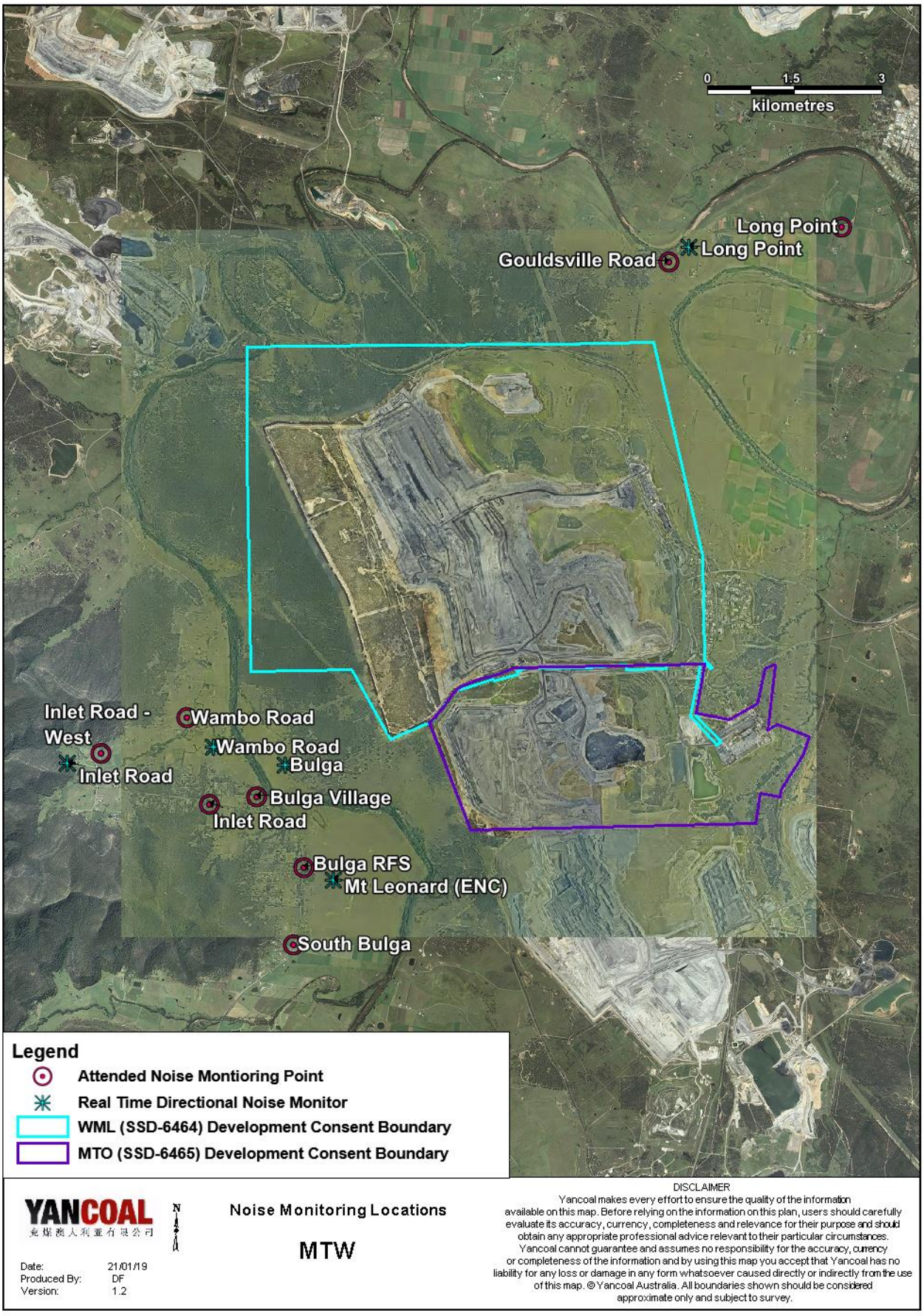


Figure 16: Noise Monitoring Location Plan

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 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 February are provided in **Table 8**.

Table 8: Supplementary Attended Noise Monitoring Data – February 2020

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
592	2	2	0.4

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

6.0 OPERATIONAL DOWNTIME

During February, a total of 48 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**.

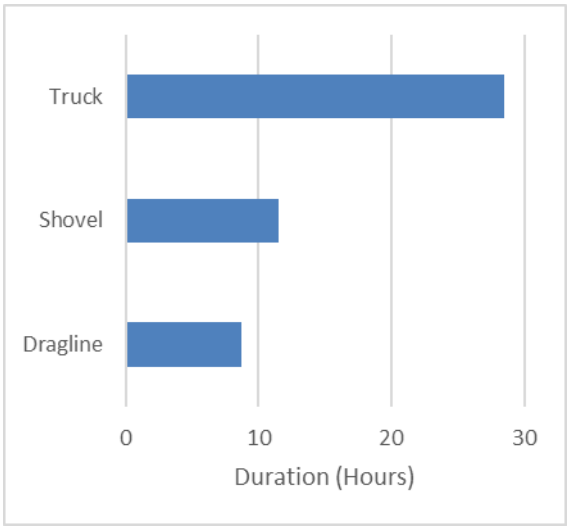


Figure 17: Operational Downtime by Equipment Type – February 2020

7.0 REHABILITATION

During February 2020, 2.8 Ha of land was released, 3.0 Ha of land was bulk shaped and 3.6 Ha of land was topsoiled.

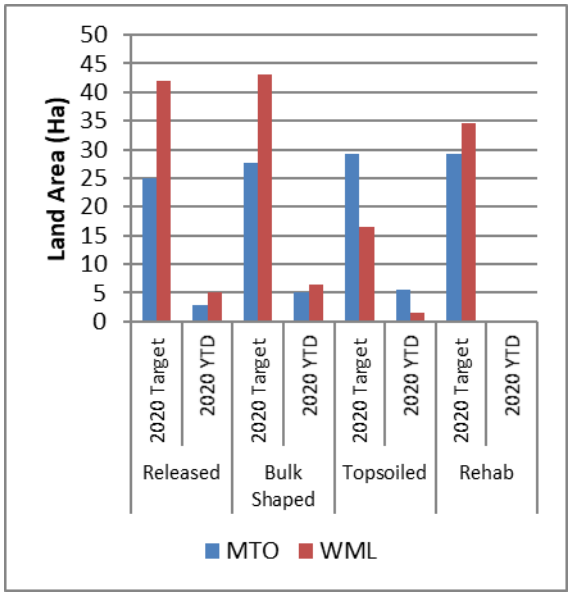


Figure 18: Rehabilitation YTD - February 2020

8.0 ENVIRONMENTAL INCIDENTS

There was one reportable environmental incident during the reporting period.

On 9 February 2020, two Sediment Dams overtopped their spillways due to greater than design rainfall. A total of 86.4mm of rainfall was recorded from the rain event (which began on 6 February) prior to either sediment dam overtopping. Notifications to the relevant regulatory authorities was undertaken by the MTW Environment and Community Manager in accordance with the sites Pollution Incident Response Management Plan. Both EPA and DPIE have responded that no regulatory action will be taken for the sediment basin overtopping.

9.0 COMPLAINTS

14 complaints were received during the reporting period. Details of these complaints are shown in **Table 9** below.

Table 9: Complaints Summary YTD

	Noise	Dust	Blast	Lighting	Other	Total
January	2	4	5	0	0	11
February	6	1	4	2	1	14
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						
Total	8	5	9	2	1	25

Appendix A: Meteorological Data

Table 10: Meteorological Data – Charlton Ridge Meteorological Station – February 2020

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)
1/02/2020	44	24	71	14	200	3.7	0.0
2/02/2020	43	22	93	14	273	5.6	5.2
3/02/2020	38	19	94	7	166	3.0	0.2
4/02/2020	25	16	71	37	118	4.4	0.0
5/02/2020	29	15	73	37	125	3.2	0.0
6/02/2020	21	17	95	62	129	3.2	21.4
7/02/2020	22	17	97	79	144	3.8	16.2
8/02/2020	24	15	97	64	123	4.9	16.2
9/02/2020	22	17	97	87	119	5.2	37.6
10/02/2020	29	19	96	50	116	1.6	0.6
11/02/2020	33	17	95	33	148	1.9	0.0
12/02/2020	31	20	91	46	125	2.8	0.0
13/02/2020	28	20	92	59	119	3.4	0.8
14/02/2020	30	18	91	30	132	2.8	0.4
15/02/2020	31	15	92	41	179	2.1	10.8
16/02/2020	28	17	94	52	136	2.7	0.0
17/02/2020	23	18	96	77	179	1.7	6.4
18/02/2020	33	17	99	41	264	2.7	0.0
19/02/2020	30	19	93	21	277	4.4	15.8
20/02/2020	28	14	74	30	172	2.0	0.0
21/02/2020	28	17	76	42	116	2.8	0.0
22/02/2020	25	16	93	51	121	3.1	3.2
23/02/2020	26	18	89	46	111	2.5	0.0
24/02/2020	25	17	89	57	131	1.9	0.6
25/02/2020	31	17	92	39	151	1.8	0.0
26/02/2020	32	19	87	42	267	3.0	0.2
27/02/2020	26	16	85	53	136	2.6	0.2
28/02/2020	29	13	94	22	168	2.1	0.0
29/02/2020	29	15	80	38	128	2.9	0.0

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