Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

May 2020

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Revision History

Version No.	Version Details	Document Status	Date
1.0	**Environmental Advisor**	**Final**	**30/07/2020**

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 May to 31 May 2020.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

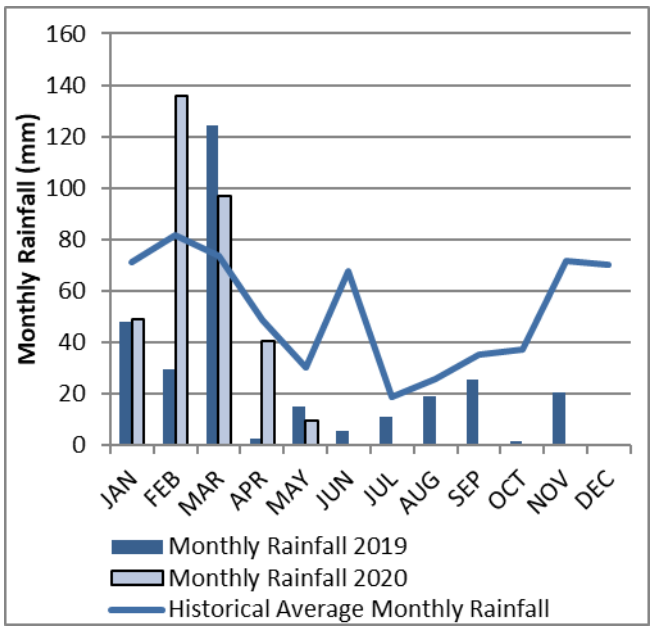
Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

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)
May	9.6	331.8



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 northwest and south were dominant during the reporting period as shown in **Figure 2.**

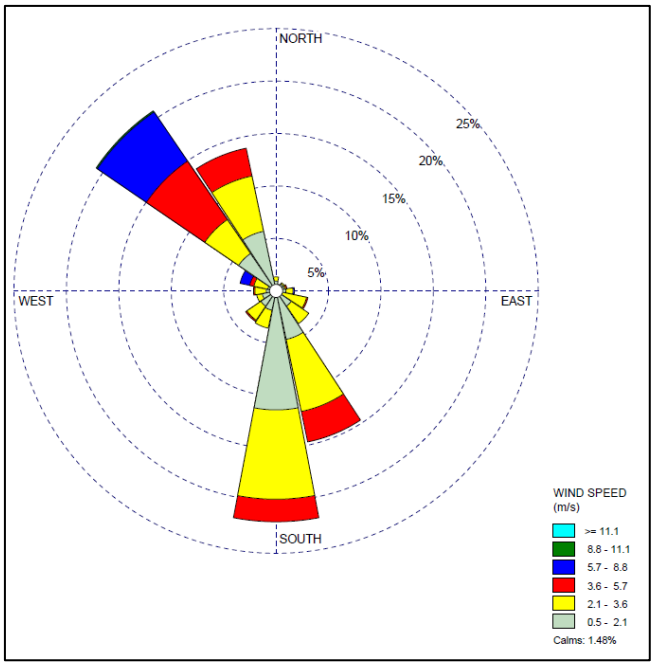


Figure 2: Charlton Ridge Wind Rose – May 2020

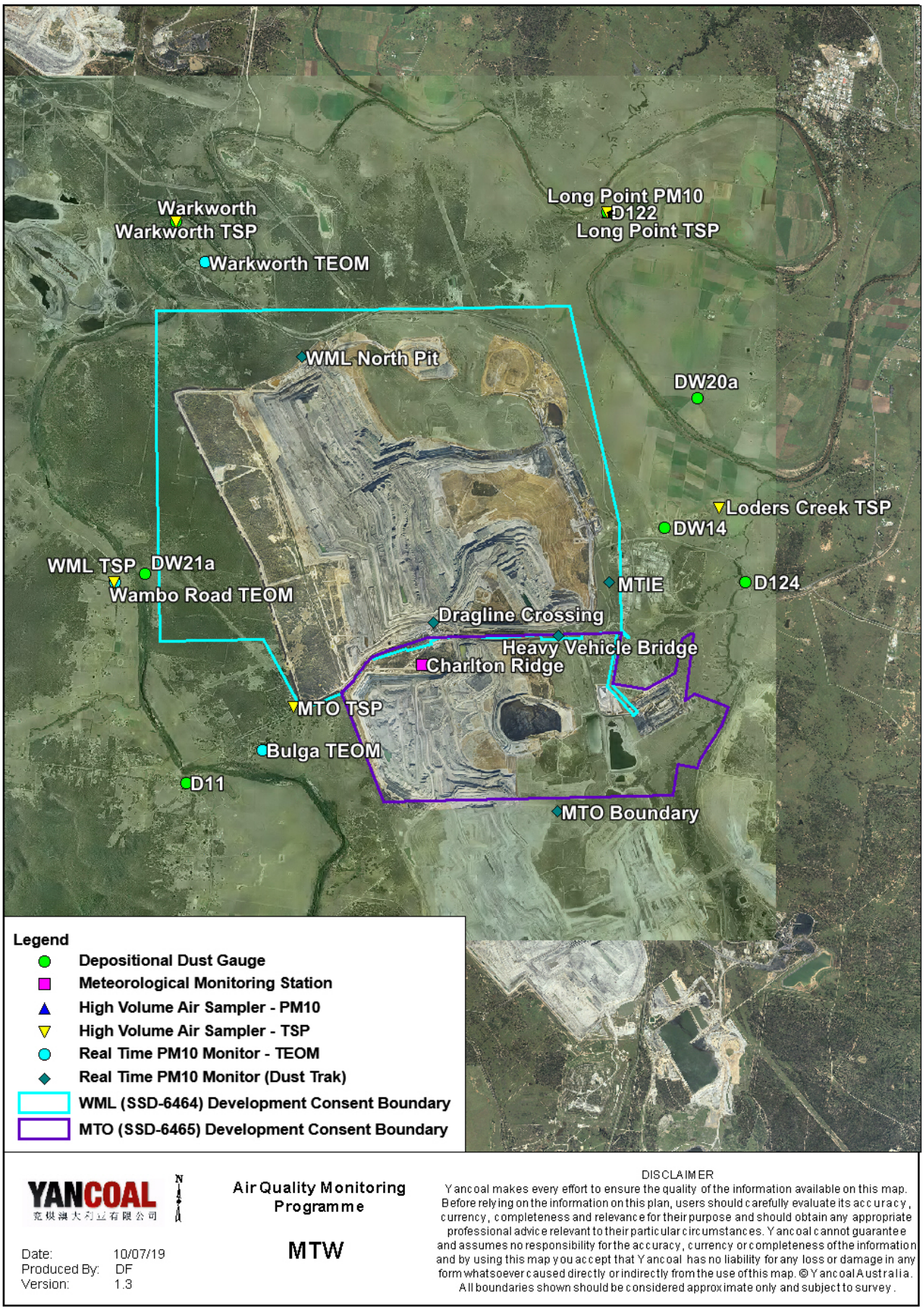


Figure 3: Air Quality Monitoring Locations

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 D122 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 D122 or 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.

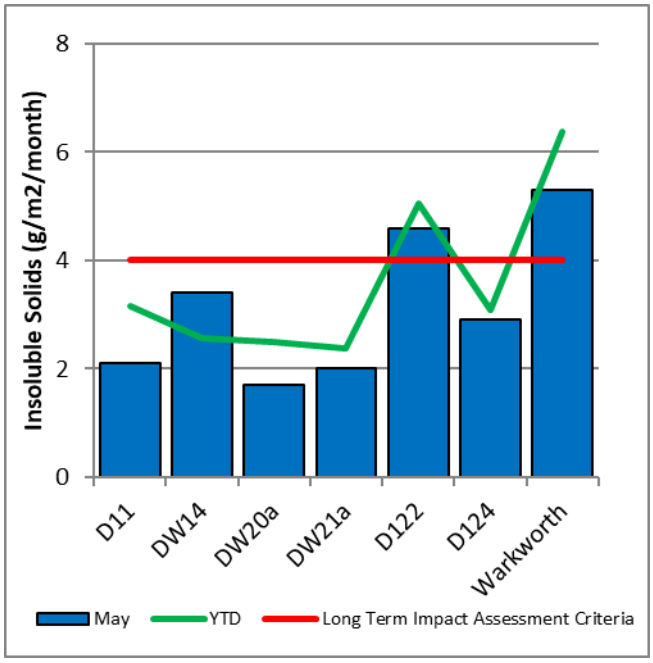


Figure 4: Depositional Dust – May 2020

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.

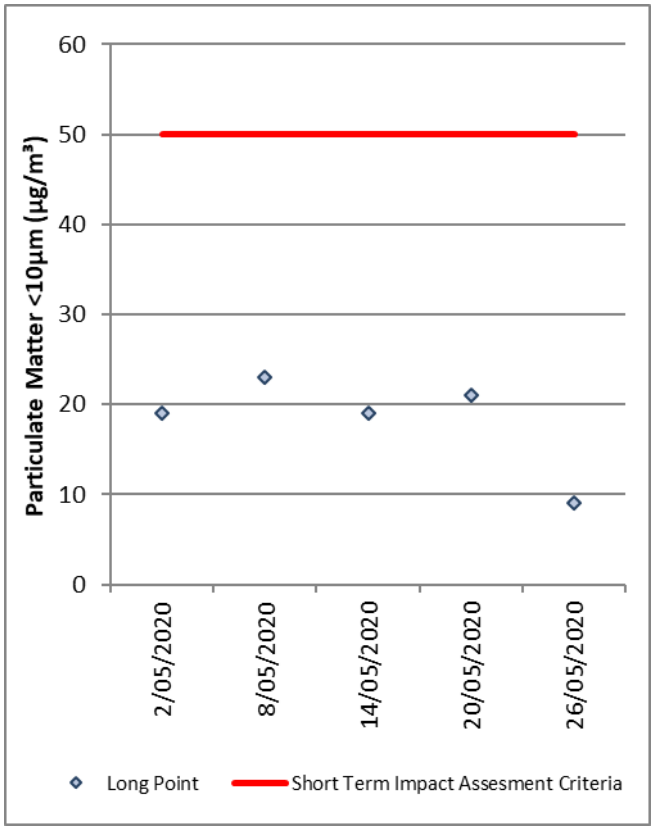


Figure 5: Individual PM10 Results – May 2020

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.

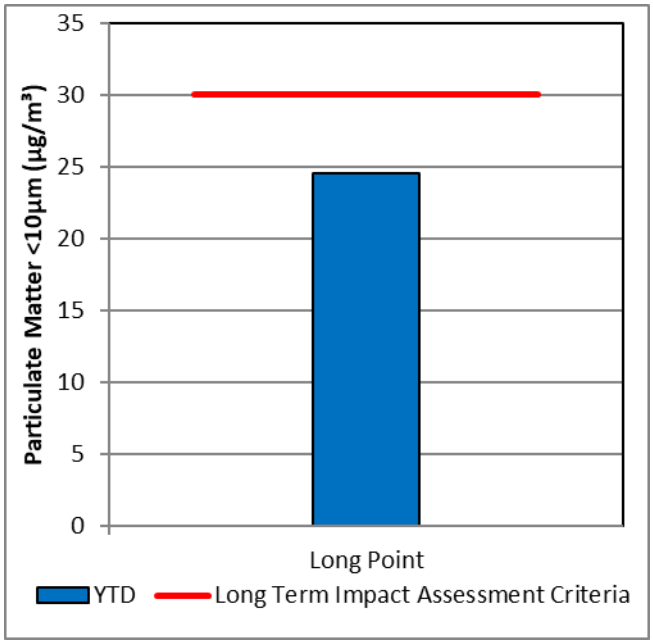


Figure 6: Annual Average PM_{10} – May 2020

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.

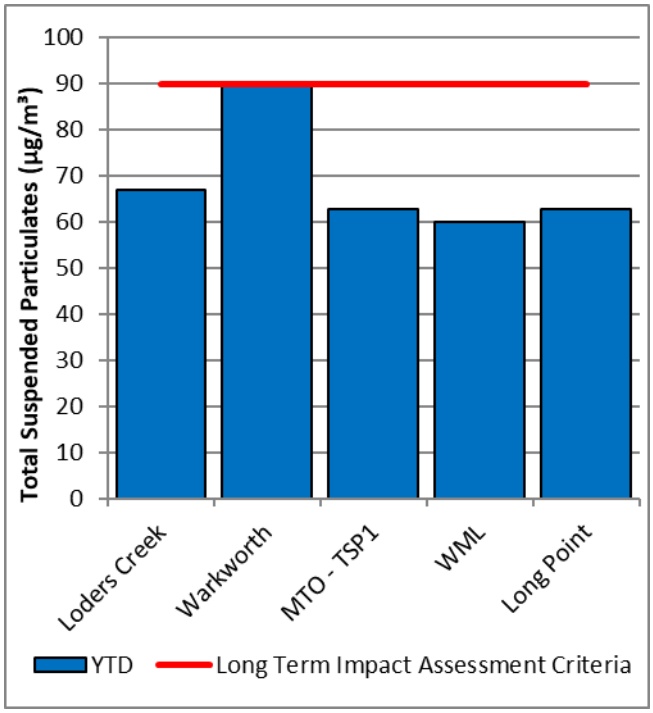


Figure 7: Annual Average Total Suspended Particulates – May 2020

2.3.3 Real Time PM_{10} Results

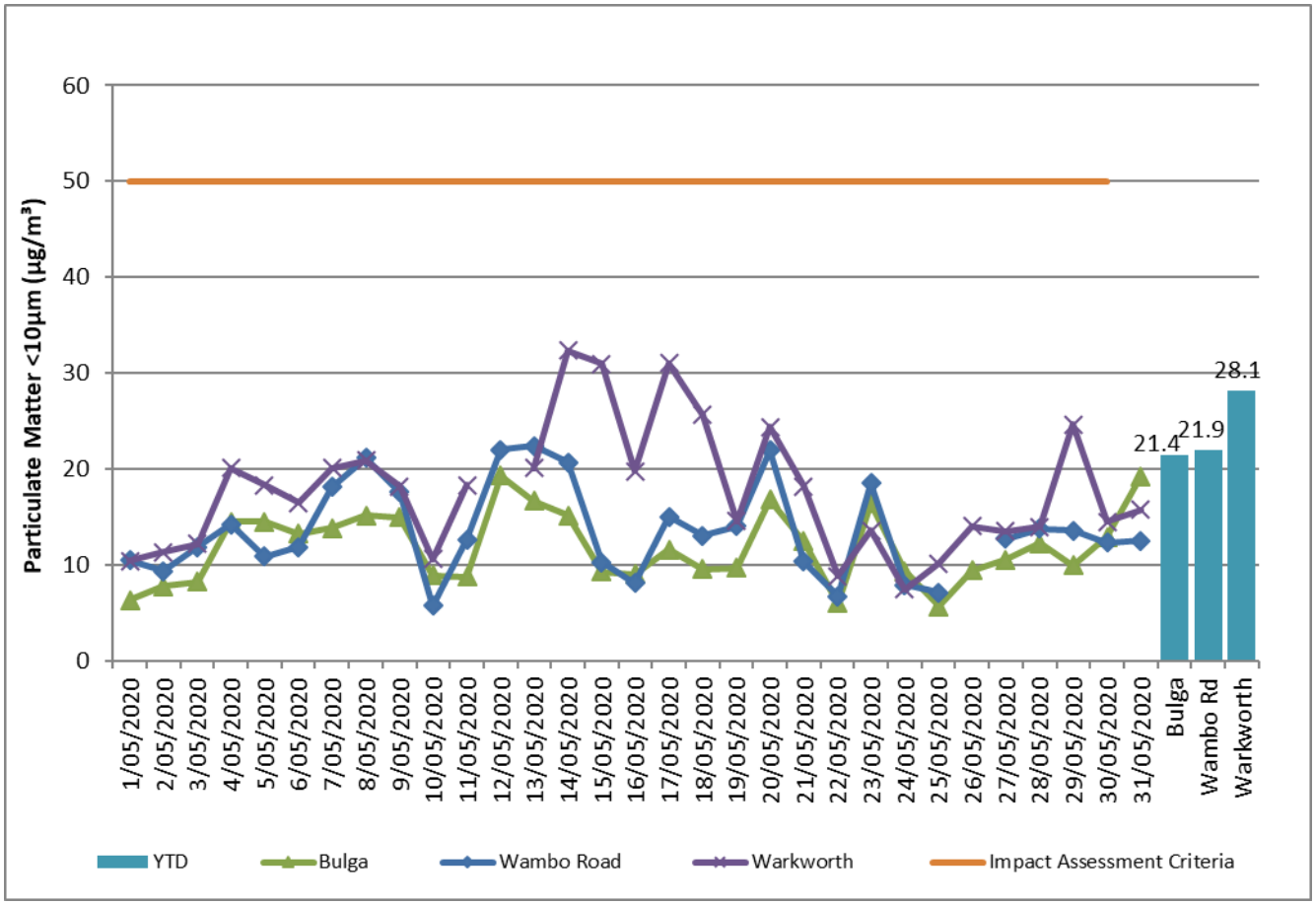
MTW maintains a network of real time PM_{10} monitors. The real time air quality monitoring stations continuously log information and transmit data to a central database, generating internal alerts when particulate matter levels exceed internal trigger limits. It should be noted that the PM_{10} monitor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

Data was not available on 26 May 2020 from the Wambo Road Road monitor due to a communications issue.

2.3.4 Real Time Alarms for Air Quality

During May, the real time monitoring system generated 201 automated air quality related alerts, including 16 alerts for adverse meteorological conditions and 185 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) – May 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 June 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 June 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 May 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 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 blasts exceeded the 115 dB(L) 5% threshold for airblast overpressure or 5mm/s 5% threshold for ground vibration.

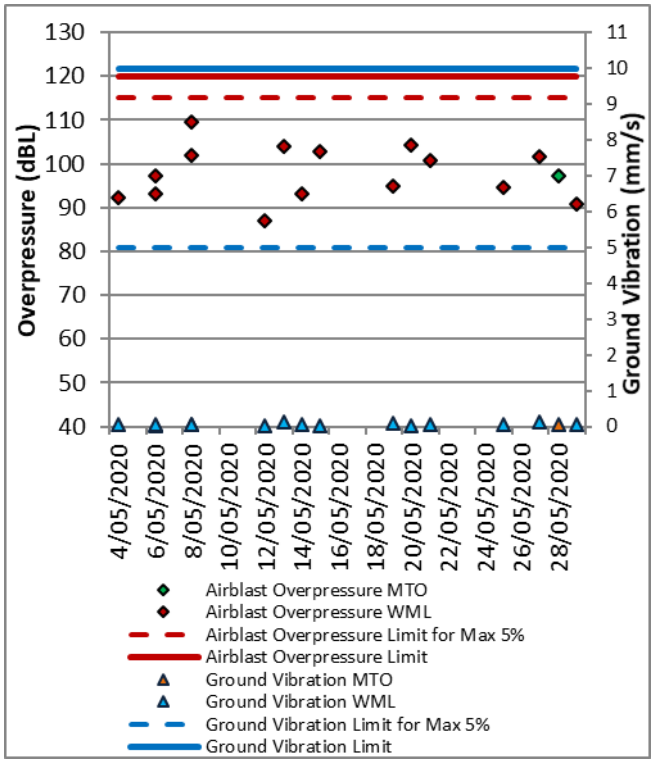


Figure 9: Abbey Green Blast Monitoring Results – May 2020

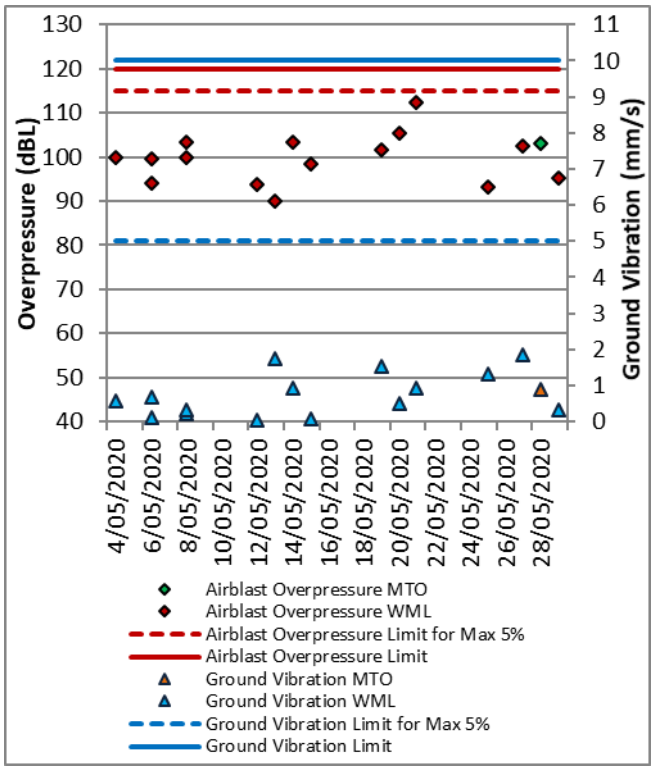


Figure 10: Bulga Village Blast Monitoring Results – May 2020

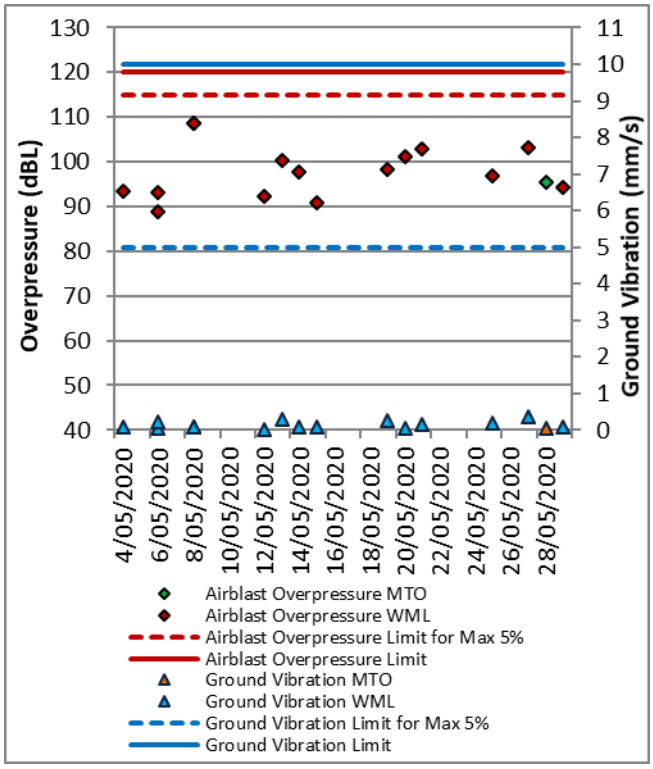


Figure 11: MTIE Blast Monitoring Results – May 2020

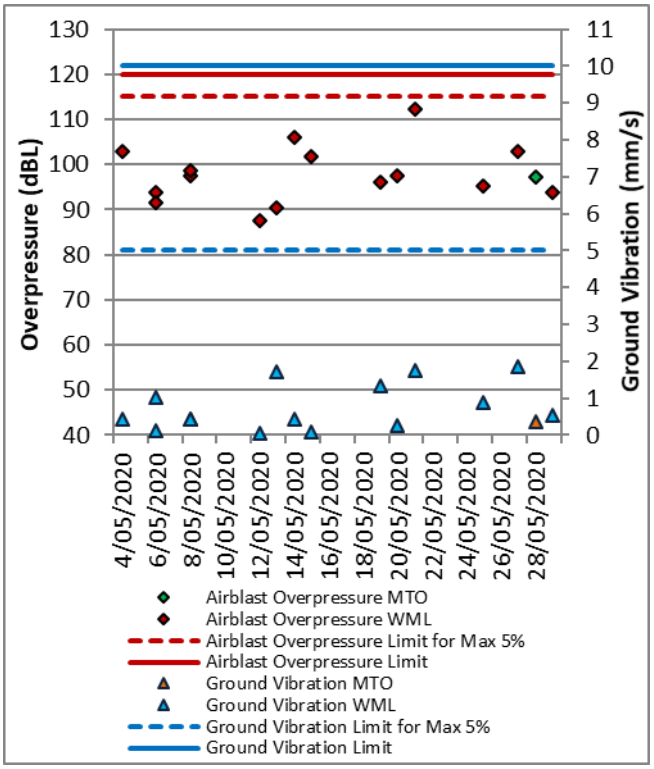


Figure 13: Wambo Road Blast Monitoring Results – May 2020

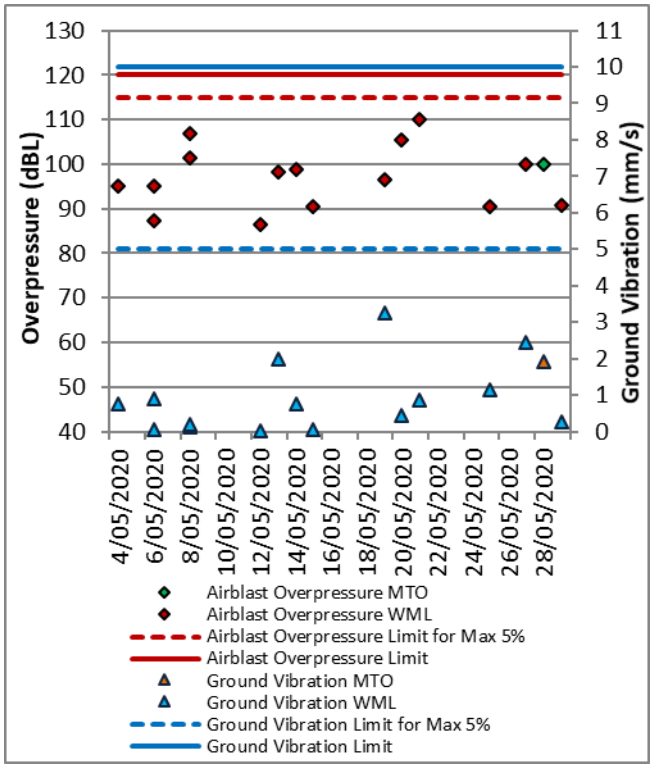


Figure 12: Wollemi Peak Road Blast Monitoring Results – May 2020

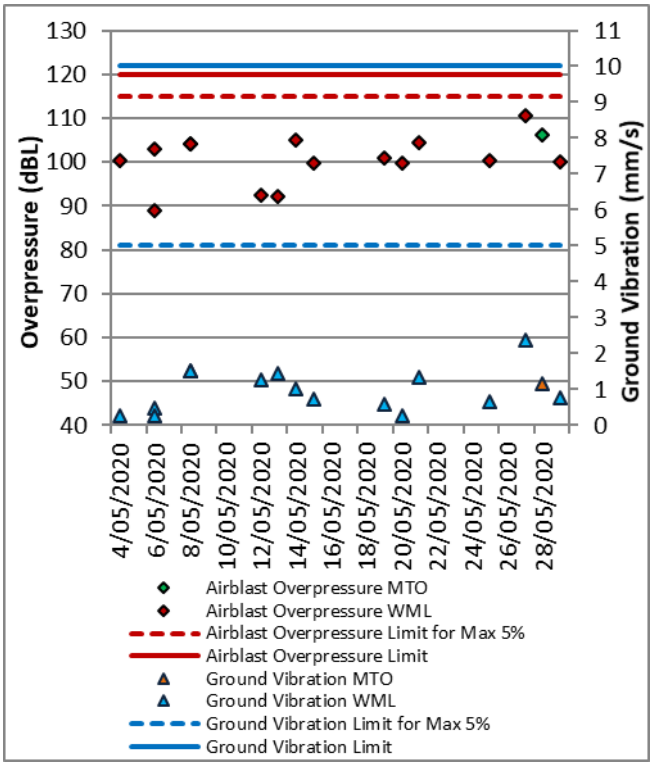


Figure 14: Warkworth Blast Monitoring Results – May 2020

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**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 7 May 2020. 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 – May 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	7/05/2020 23:09	2.2	D	37	Yes	<30	Nil
Bulga Village	7/05/2020 23:23	2.2	E	38	Yes	<25	Nil
Gouldsville	7/05/2020 21:25	2.4	D	38	Yes	IA	Nil
Inlet Rd	7/05/2020 21:27	2.4	D	37	Yes	IA	Nil
Inlet Rd West	7/05/2020 21:00	1.9	E	35	Yes	IA	Nil
Long Point	7/05/2020 21:01	1.9	E	35	Yes	IA	Nil
South Bulga	7/05/2020 23:53	1.7	E	35	Yes	<30	Nil
Wambo Road	7/05/2020 21:54	2.3	D	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 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 – May 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	7/05/2020 23:09	2.2	D	47	Yes	<30	Nil
Bulga Village	7/05/2020 23:23	2.2	E	48	Yes	<25	Nil
Gouldsville	7/05/2020 21:25	2.4	D	48	Yes	IA	Nil
Inlet Rd	7/05/2020 21:27	2.4	D	47	Yes	IA	Nil
Inlet Rd West	7/05/2020 21:00	1.9	E	45	Yes	IA	Nil
Long Point	7/05/2020 21:01	1.9	E	45	Yes	IA	Nil
South Bulga	7/05/2020 23:53	1.7	E	45	Yes	<30	Nil
Wambo Road	7/05/2020 21:54	2.3	D	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 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 – May 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	7/05/2020 23:09	2.2	D	37	Yes	<30	Nil
Bulga Village	7/05/2020 23:23	2.2	E	38	Yes	IA	Nil
Gouldsville	7/05/2020 21:25	2.4	D	35	Yes	IA	Nil
Inlet Rd	7/05/2020 21:27	2.4	D	37	Yes	IA	Nil
Inlet Rd West	7/05/2020 21:00	1.9	E	35	Yes	IA	Nil
Long Point	7/05/2020 21:01	1.9	E	35	Yes	IA	Nil
South Bulga	7/05/2020 23:53	1.7	E	36	Yes	<30	Nil
Wambo Road	7/05/2020 21:54	2.3	D	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. 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 – May 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	7/05/2020 23:09	2.2	D	47	Yes	<30	Nil
Bulga Village	7/05/2020 23:23	2.2	E	48	Yes	IA	Nil
Gouldsville	7/05/2020 21:25	2.4	D	45	Yes	IA	Nil
Inlet Rd	7/05/2020 21:27	2.4	D	47	Yes	IA	Nil
Inlet Rd West	7/05/2020 21:00	1.9	E	45	Yes	IA	Nil
Long Point	7/05/2020 21:01	1.9	E	45	Yes	IA	Nil
South Bulga	7/05/2020 23:53	1.7	E	46	Yes	31	Nil
Wambo Road	7/05/2020 21:54	2.3	D	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. 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 – May 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	7/05/2020 23:09	<30/<30	NA/NA	NA/NA	NA/NA	NA/NA	Bulga RFS
Bulga Village	7/05/2020 23:23	<25/IA	NA/NA	NA/NA	NA/NA	NA/NA	Bulga
Gouldsville	7/05/2020 21:25	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	Gouldsville
Inlet Rd	7/05/2020 21:27	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	Inlet Rd
Inlet Rd West	7/05/2020 21:00	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	Inlet Rd
Long Point	7/05/2020 21:01	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	Long Point
South Bulga	7/05/2020 23:53	<30/<30	NA/NA	NA/NA	NA/NA	NA/NA	South Bulga
Wambo Road	7/05/2020 21:54	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	Wambo

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.

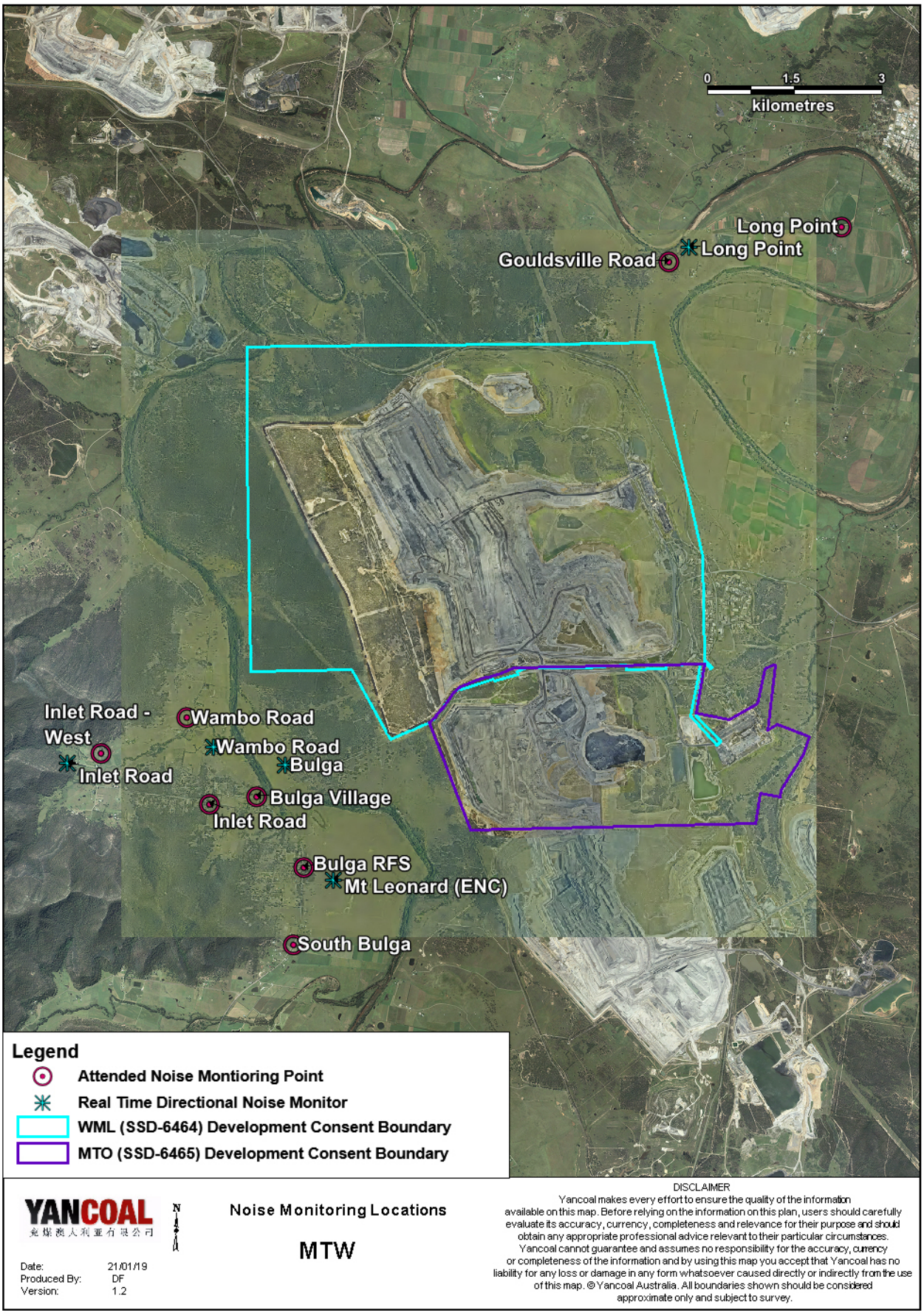


Figure 16: Noise Monitoring Location Plan

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 May are provided in **Table 8**.

Table 8: Supplementary Attended Noise Monitoring Data –May 2020

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
636	2	1	0.3

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

6.0 OPERATIONAL DOWNTIME

During May, a total of 67 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**.

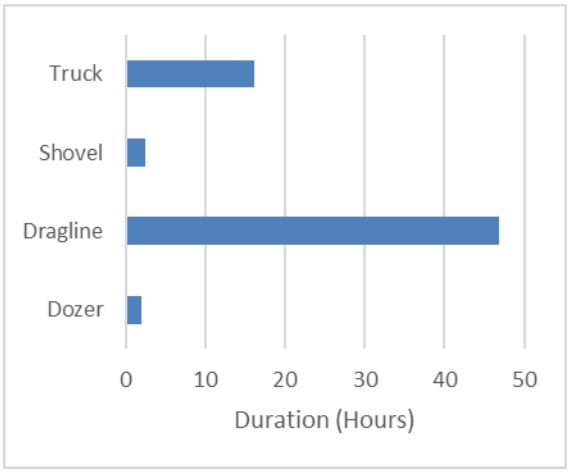


Figure 17: Operational Downtime by Equipment Type – May 2020

7.0 REHABILITATION

During May 2020, 4.9 Ha of land was released, 4.9 Ha of land was bulk shaped and 1.5 Ha of land was topsoiled.

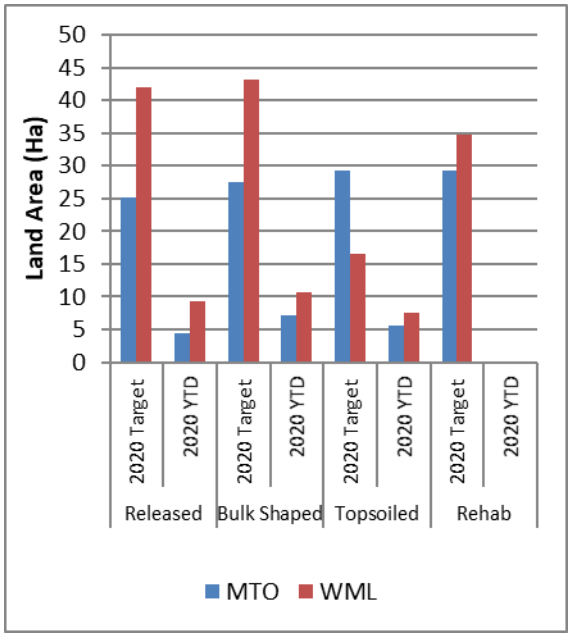


Figure 18: Rehabilitation YTD - May 2020

8.0 ENVIRONMENTAL INCIDENTS

There was one reportable environmental incident during the reporting period.

Dam 9S was observed to be overtopping its spillway into an unnamed tributary of Loders Creek on 14 May 2020. Containment actions were implemented immediately (pumps were activated to pump Dam 9S water levels down, valves for all sources of water to Dam 9S were isolated, additional pumping was established at the licenced discharge point location to return some water in the unnamed tributary back to the site), and a surface water sampling program was initiated. Investigation into the cause of the incident commenced and is ongoing. All relevant government agencies were contacted on 14 May 2020.

9.0 COMPLAINTS

26 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	13	3	7	0	0	23
April	21	7	1	1	1	31
May	4	4	11	6	1	26
June						
July						
August						
September						
October						
November						
December						
Total	46	19	28	9	3	105

Appendix A: Meteorological Data

Table 10: Meteorological Data – Charlton Ridge Meteorological Station – May 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)
1/05/2020	15	7	82	38	310	6.2	0.0
2/05/2020	17	9	75	42	302	5.8	0.0
3/05/2020	20	6	77	29	224	2.3	0.0
4/05/2020	19	5	90	30	202	1.7	0.0
5/05/2020	18	8	93	59	162	1.8	0.6
6/05/2020	21	7	99	46	255	1.5	0.2
7/05/2020	21	7	97	46	305	2.6	0.0
8/05/2020	25	10	91	33	289	2.8	0.0
9/05/2020	25	10	80	39	285	3.4	0.0
10/05/2020	18	7	79	19	225	2.4	0.0
11/05/2020	17	3	72	26	217	2.0	0.0
12/05/2020	19	3	83	37	215	1.4	0.0
13/05/2020	19	4	88	36	270	1.9	0.0
14/05/2020	18	5	87	47	170	2.6	0.0
15/05/2020	17	8	94	51	162	3.0	0.2
16/05/2020	20	8	95	44	152	2.6	0.2
17/05/2020	20	8	88	46	159	2.3	0.0
18/05/2020	19	10	89	60	143	2.2	0.0
19/05/2020	20	8	99	52	163	1.7	0.0
20/05/2020	23	9	95	42	267	2.4	0.0
21/05/2020	17	8	90	49	273	2.2	0.4
22/05/2020	17	2	84	41	277	3.5	0.4
23/05/2020	14	7	93	61	317	5.4	0.6
24/05/2020	17	8	94	47	239	3.6	0.0
25/05/2020	15	10	91	53	199	2.9	6.6
26/05/2020	18	10	89	65	165	3.7	0.0
27/05/2020	18	9	93	57	164	1.5	0.2
28/05/2020	21	8	98	47	253	1.6	0.0
29/05/2020	20	9	93	48	158	1.8	0.0
30/05/2020	19	8	98	55	169	1.7	0.2
31/05/2020	21	7	98	44	228	1.3	0.0

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