Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

July 2019

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Revision History

Version No.	Version Details	Document Status	Date
1.0	**Environmental Advisor**	**Final**	**09/09/2019**

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 July to 31 July 2019.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

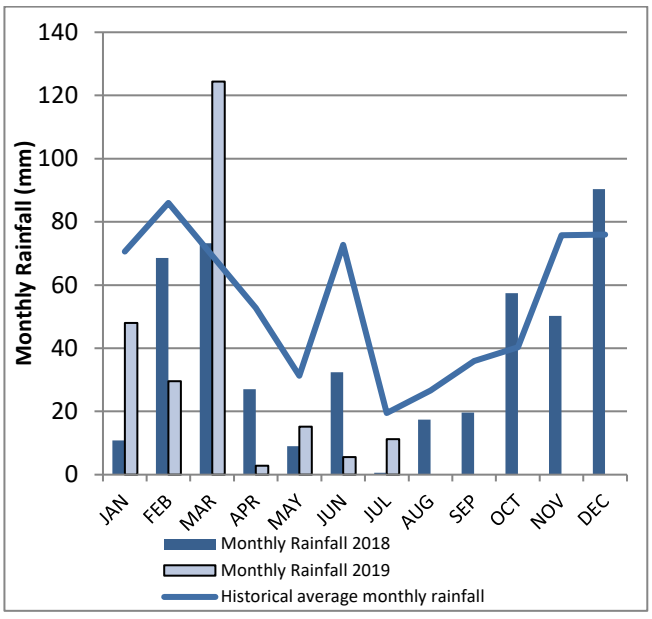
Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

2.1.1 Rainfall

Rainfall for the reporting period is summarised in **Table 1**, the year-to-date monthly rainfall totals, 2019 monthly rainfall totals and historical average monthly rainfall trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2019	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
July	11.2	236.8



Note: The historical average monthly rainfall is calculated from 2007 to 2018 monthly totals

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

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

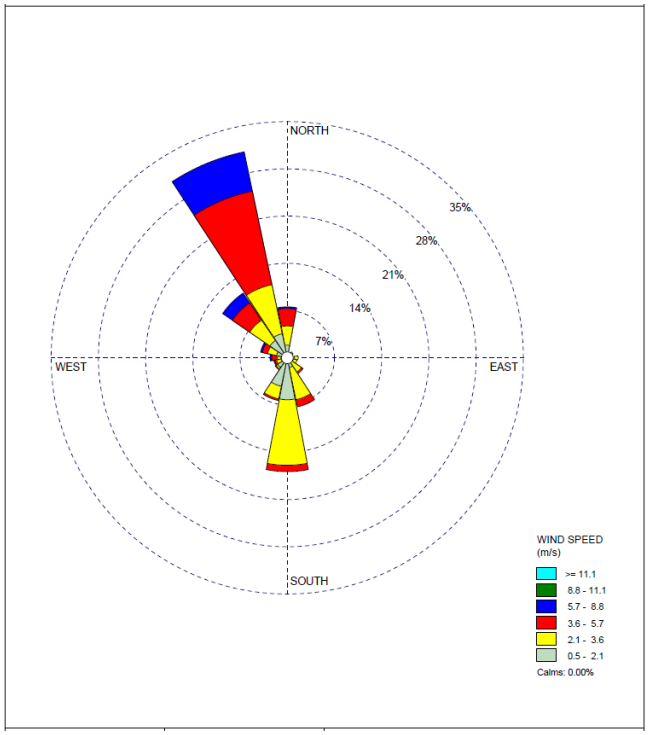


Figure 2: Charlton Ridge Wind Rose – July 2019

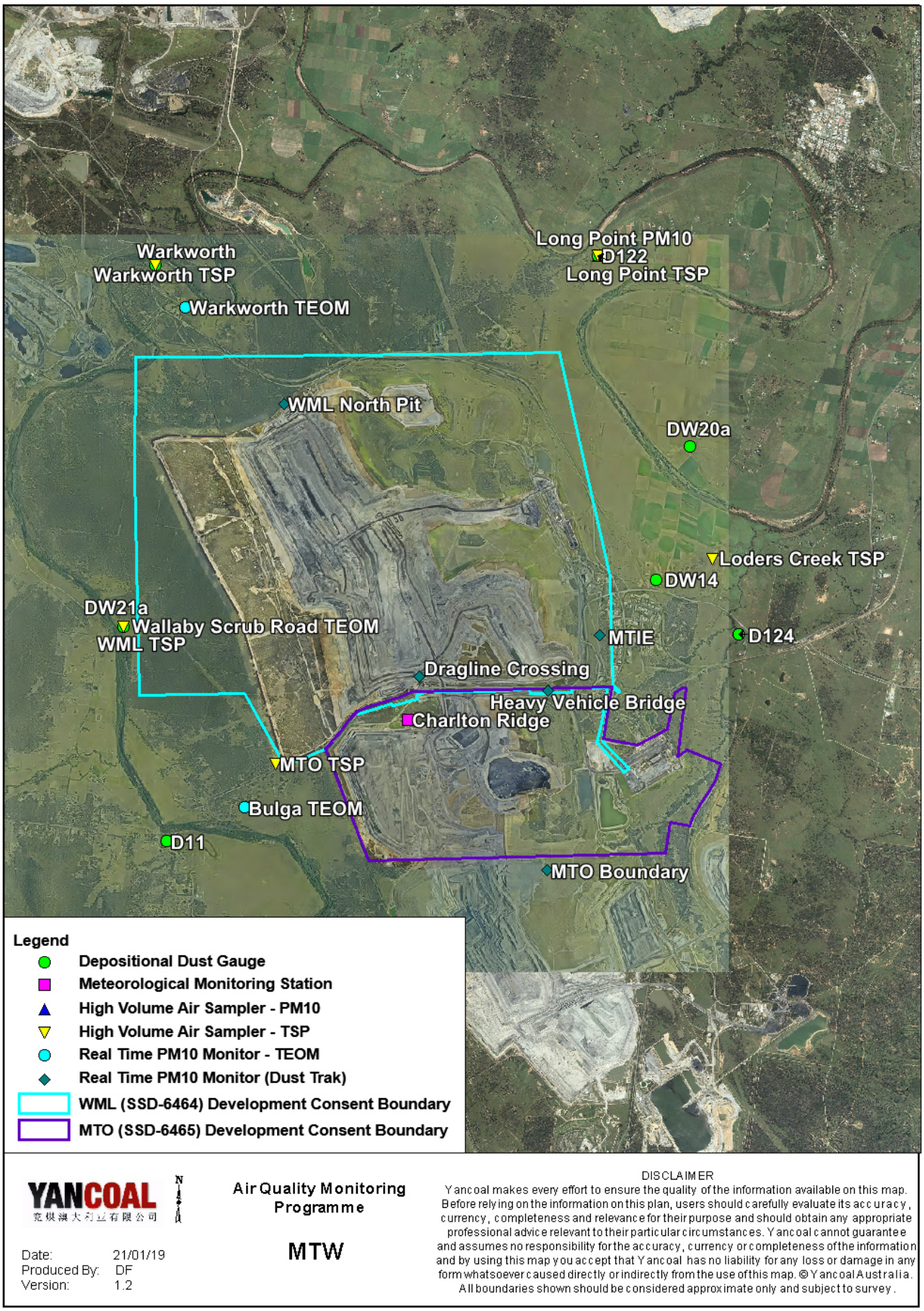


Figure 3: Air Quality Monitoring Locations

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 Warkworth and D124 monitor recorded monthly results above the long-term impact assessment criteria of 4.0 g/m^2 per month. Field notes associated with D124 confirm the presence of insects and bird droppings. As such the result is considered contaminated and will be excluded from calculation of the annual average. There is no evidence to suggest that the Warkworth result is contaminated. Accordingly, the result 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 2019 Annual Review Report.

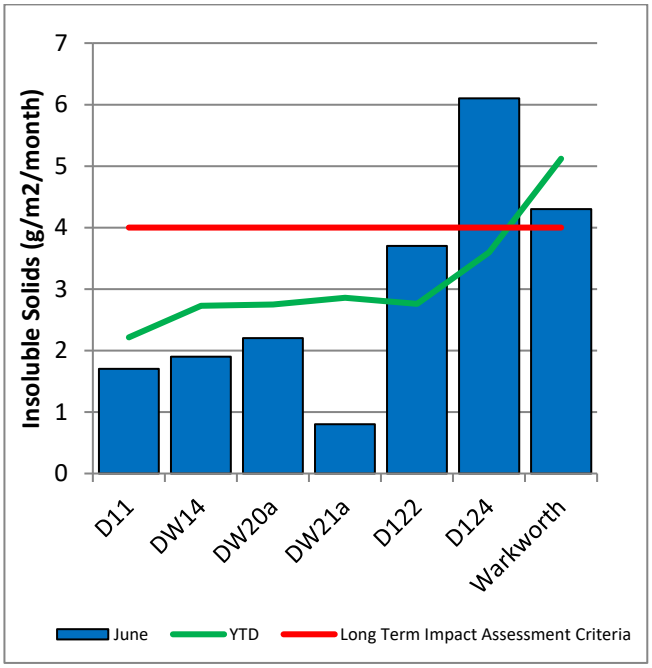


Figure 4: Depositional Dust – July 2019

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.

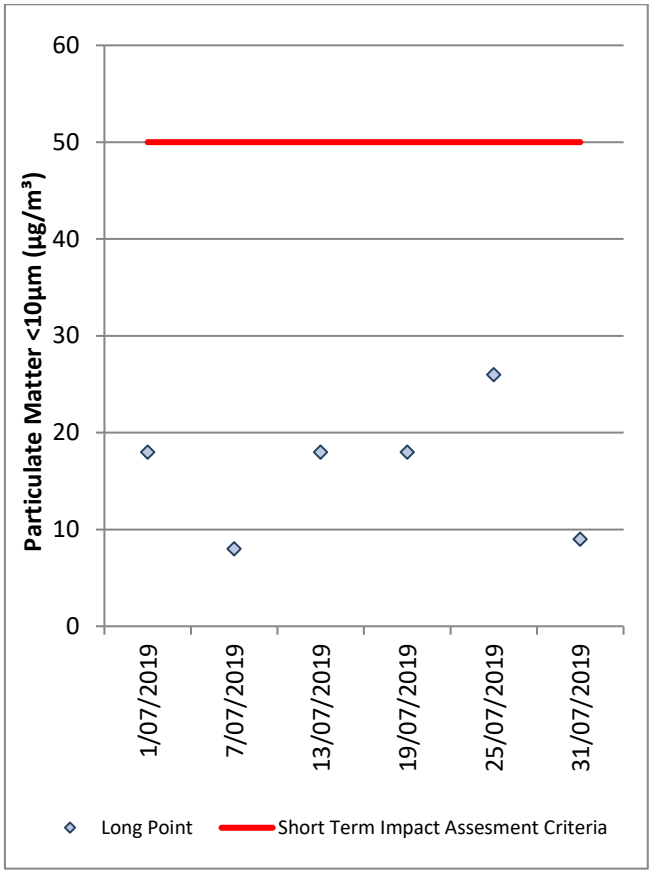


Figure 5: Individual PM10 Results – July 2019

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

An assessment of MTW's contribution to the long term assessment criteria will be reported in the 2019 Annual Review Report.

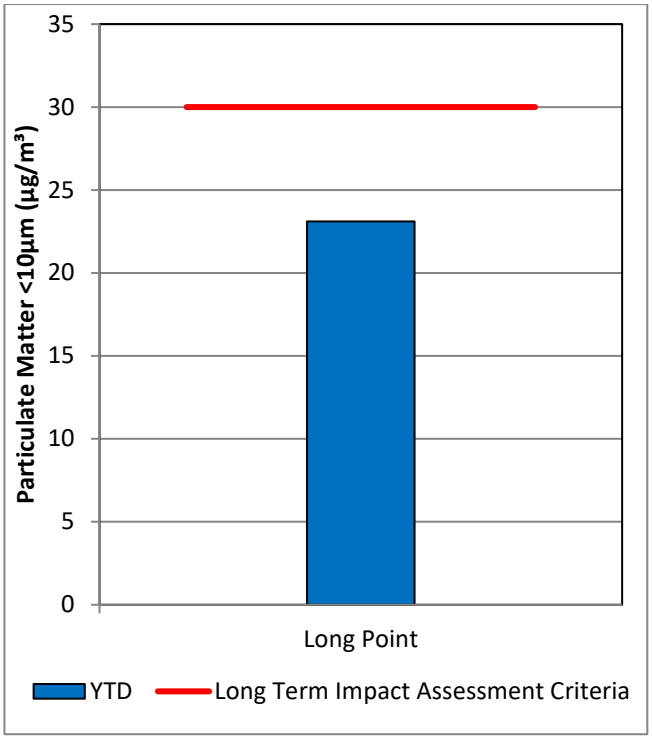


Figure 6: Annual Average PM_{10} – July 2019

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 2019 Annual Review Report.

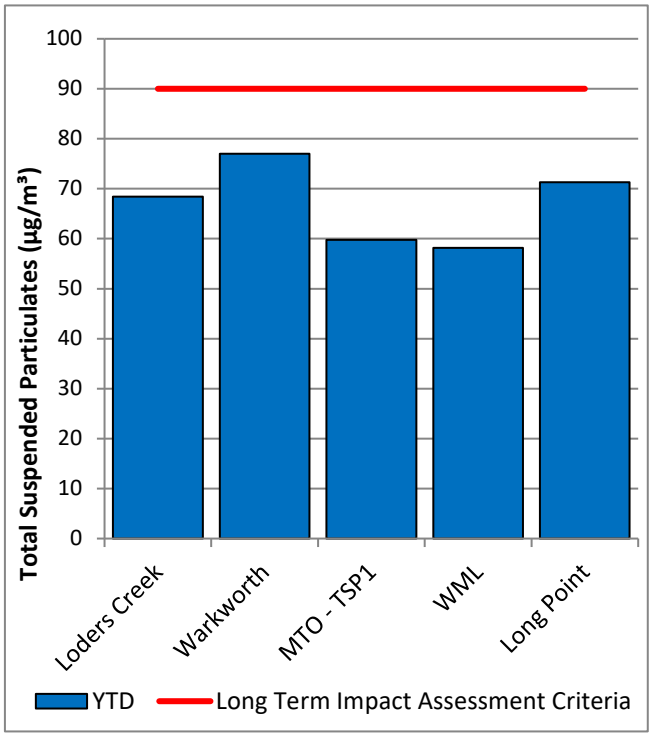


Figure 7: Annual Average Total Suspended Particulates –July 2019

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" is planned to be moved to a representative location west of Wollombi Brook and be renamed "Wambo Road TEOM". This change was submitted to DPIE on 31 July 2019 during an update to the MTW Air Quality Management Plan. Figures in the MEMR will be updated once the updated AQMP has been approved and the monitor moved to the new location.

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 July, the real time monitoring system generated 136 automated air quality related alerts, including 17 alerts for adverse meteorological conditions and 119 alerts for elevated PM_{10} levels.

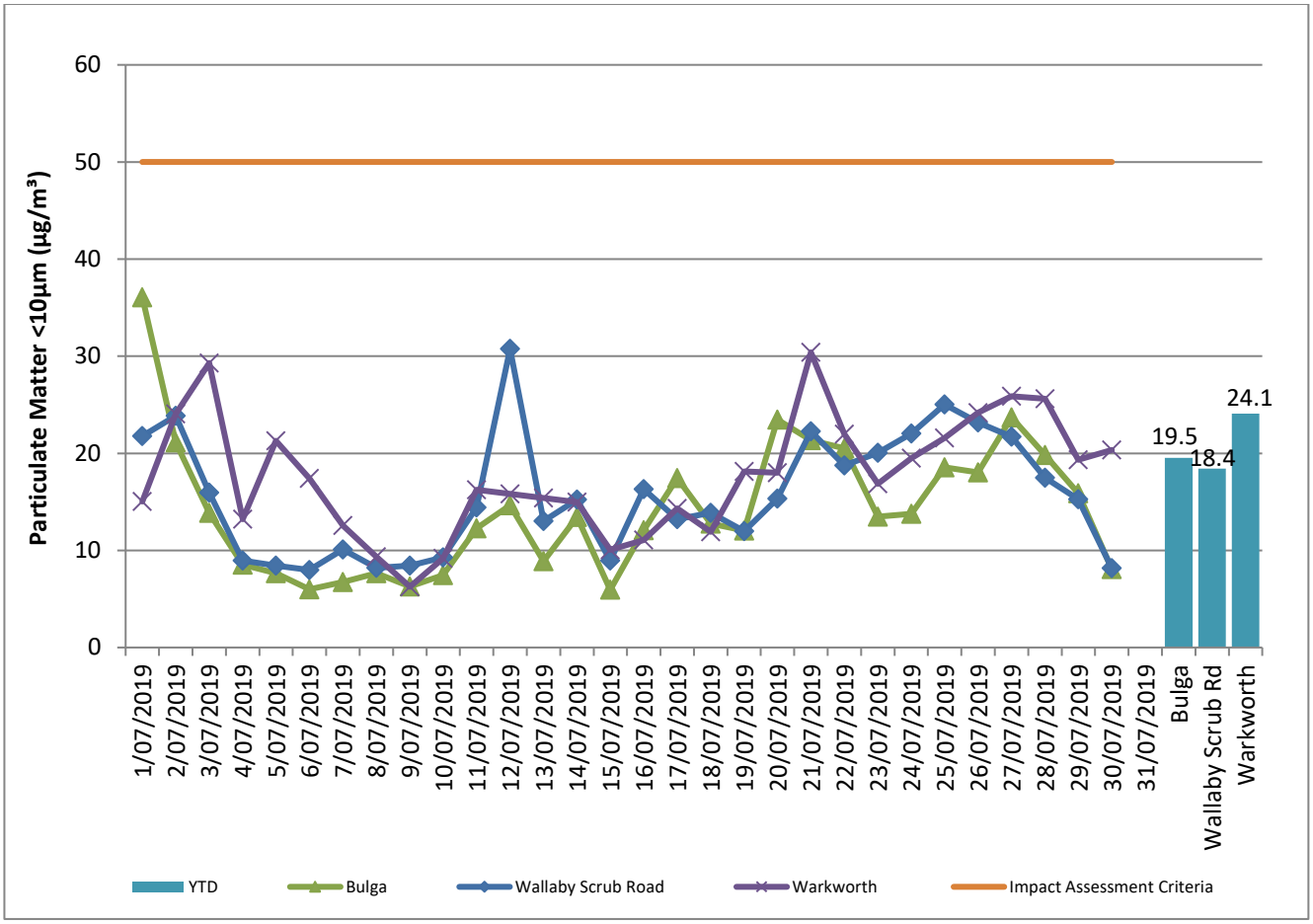


Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – July 2019

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 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 2019 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 September 2019 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 July 2019, 22 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.

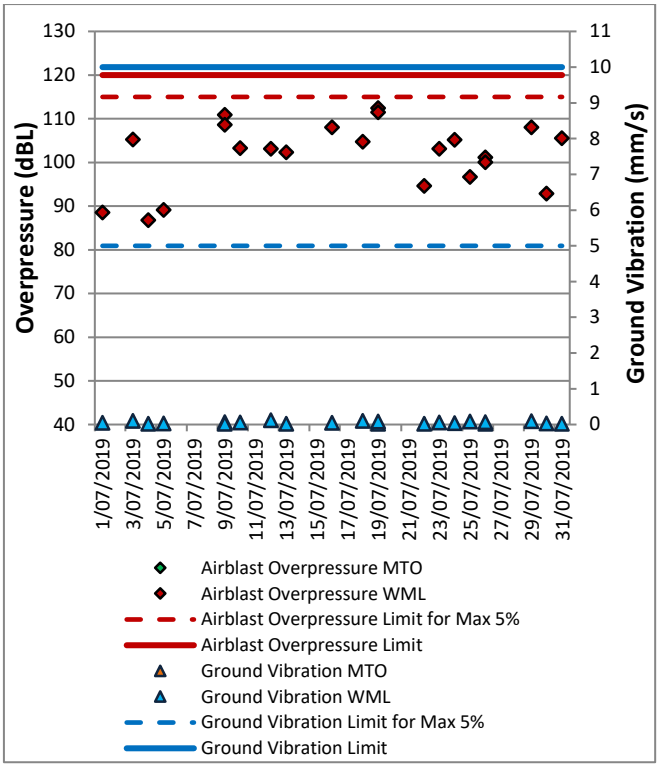


Figure 9: Abbey Green Blast Monitoring Results – July 2019

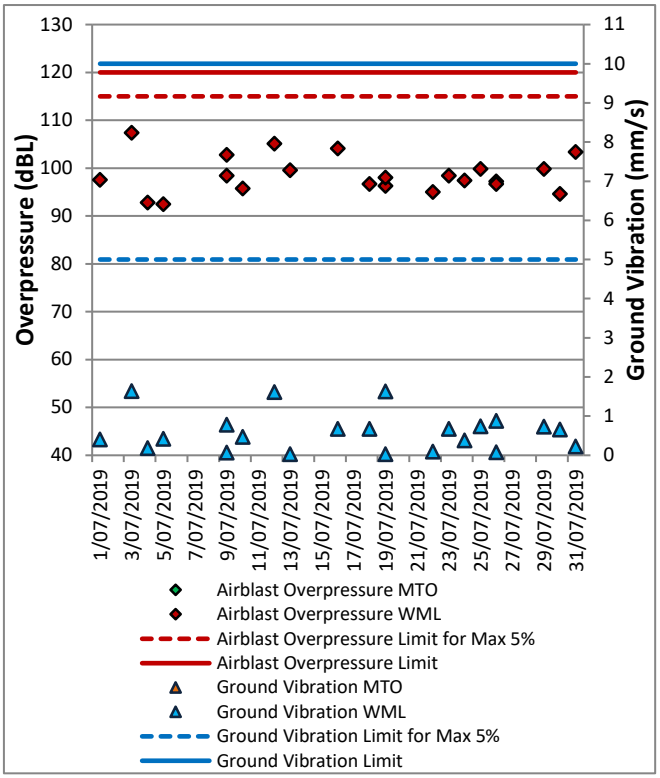


Figure 10: Bulga Village Blast Monitoring Results –July 2019

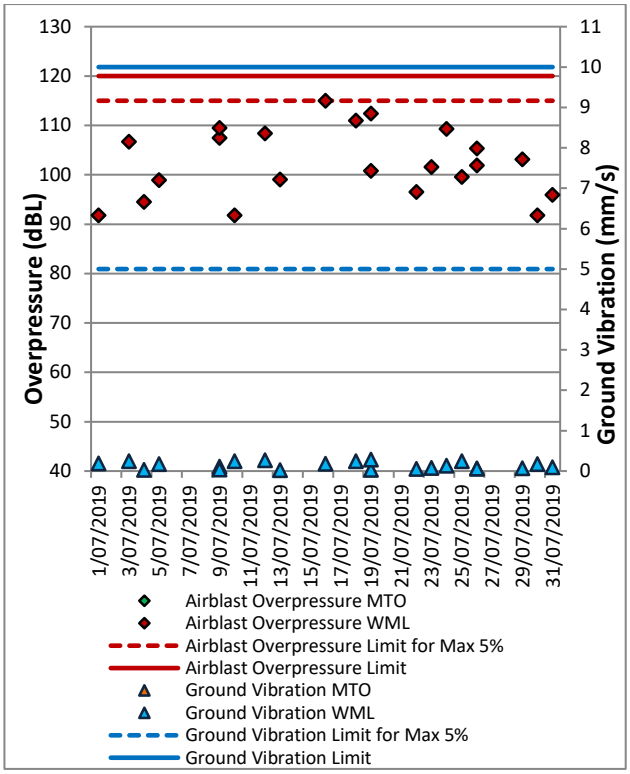


Figure 11: MTIE Blast Monitoring Results –July 2019

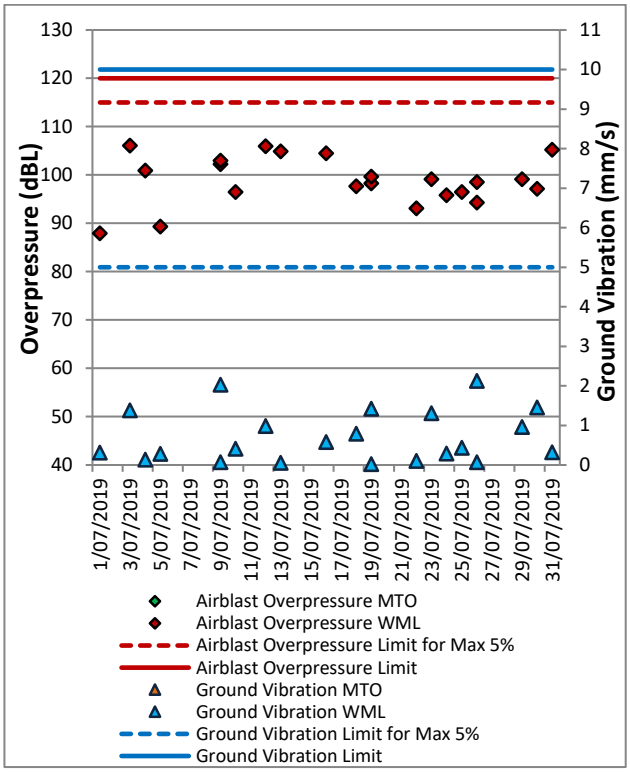


Figure 12: Wollemi Peak Road Blast Monitoring Results –July 2019

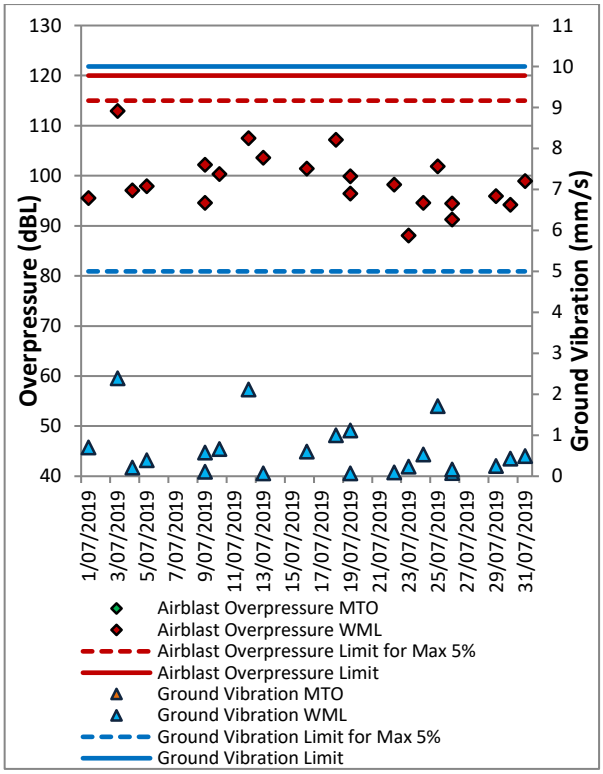


Figure 13: Wambo Road Blast Monitoring Results –July 2019

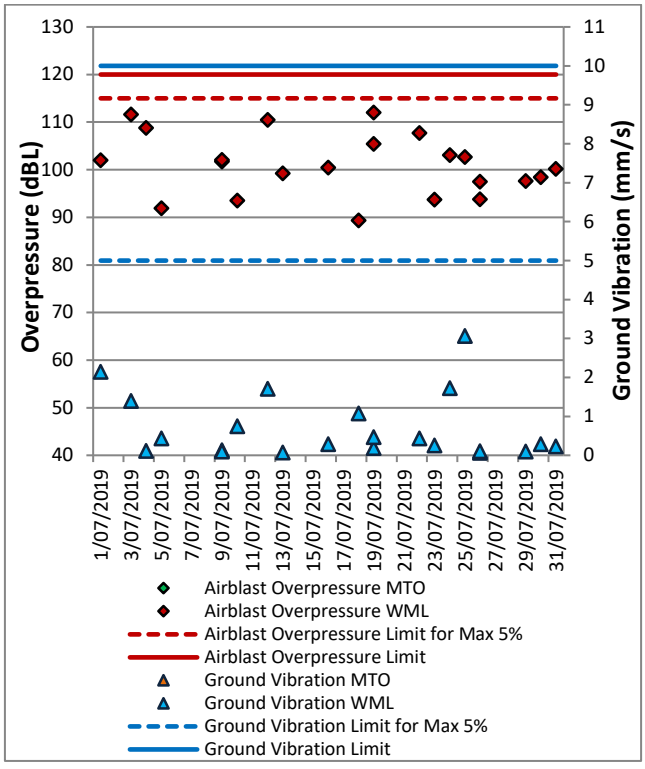


Figure 14: Warkworth Blast Monitoring Results –July 2019

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 18 July 2019. 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 –July 2019

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	18/07/2019 23:37	2.3	D	37	Yes	IA	Nil
Bulga Village	18/07/2019 22:56	1.5	E	38	Yes	<25	Nil
Gouldsville	18/07/2019 21:22	1.7	E	38	Yes	30	Nil
Inlet Rd	18/07/2019 21:21	1.7	E	37	Yes	IA	Nil
Inlet Rd West	18/07/2019 21:01	1.9	F	35	Yes	IA	Nil
Long Point	18/07/2019 21:00	1.9	F	35	Yes	IA	Nil
South Bulga	19/07/2019 00:21	3.3	D	35	No	IA	NA
Wambo Road	18/07/2019 21:44	0.9	F	38	Yes	26	Nil

Notes:
1. Noise emission limits 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. Estimated or measured LAeq,15minute 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.

Table 4: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria –July 2019

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	18/07/2019 23:37	2.3	D	47	Yes	IA	Nil
Bulga Village	18/07/2019 22:56	1.5	E	48	Yes	28	Nil
Gouldsville	18/07/2019 21:22	1.7	E	48	Yes	37	Nil
Inlet Rd	18/07/2019 21:21	1.7	E	47	Yes	IA	Nil
Inlet Rd West	18/07/2019 21:01	1.9	F	45	Yes	IA	Nil
Long Point	18/07/2019 21:00	1.9	F	45	Yes	IA	Nil
South Bulga	19/07/2019 00:21	3.3	D	45	No	IA	NA
Wambo Road	18/07/2019 21:44	0.9	F	48	Yes	29	Nil

Notes:
1. Noise emission limits 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. Estimated or measured 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 –July 2019

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	18/07/2019 23:37	2.3	D	37	Yes	30	Nil
Bulga Village	18/07/2019 22:56	1.5	E	38	Yes	IA	Nil
Gouldsville	18/07/2019 21:22	1.7	E	35	Yes	IA	Nil
Inlet Rd	18/07/2019 21:21	1.7	E	37	Yes	IA	Nil
Inlet Rd West	18/07/2019 21:01	1.9	F	35	Yes	IA	Nil
Long Point	18/07/2019 21:00	1.9	F	35	Yes	IA	Nil
South Bulga	19/07/2019 00:21	3.3	D	36	No	IA	NA
Wambo Road	18/07/2019 21:44	0.9	F	38	Yes	IA	Nil

Notes:
1. Noise emission limits 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. Estimated or measured LAeq,15minute attributed to MTO;
3. Bold results in red are possible exceedances of relevant criteria; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable.

Table 6: $L_{A1,\ 1Minute}$ Mount Thorley - Impact Assessment Criteria –July 2019

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	18/07/2019 23:37	2.3	D	47	Yes	33	Nil
Bulga Village	18/07/2019 22:56	1.5	E	48	Yes	IA	Nil
Gouldsville	18/07/2019 21:22	1.7	E	45	Yes	IA	Nil
Inlet Rd	18/07/2019 21:21	1.7	E	47	Yes	IA	Nil
Inlet Rd West	18/07/2019 21:01	1.9	F	45	Yes	IA	Nil
Long Point	18/07/2019 21:00	1.9	F	45	Yes	IA	Nil
South Bulga	19/07/2019 00:21	3.3	D	46	No	IA	NA
Wambo Road	18/07/2019 21:44	0.9	F	48	Yes	IA	Nil

Notes
1. Noise emission limits 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. Estimated or measured LA1,1minute attributed to MTO;
3. Bold results in red are possible exceedances of relevant criteria; and
4. NA in exceedance column means atmospheric conditions outside conditions specified in project approval 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 penalty has been assessed. There were no noise measurements taken during the reporting period which required the penalty to be applied. The assessment for low frequency noise is shown in **Table 7**.

Table 7: Low Frequency Noise Modifying Factor Assessment –July 2019

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]	Penalty dB(A)[1]	Exceedance
Bulga RFS	18/07/2019 23:37	IA/30	NA/NA	NA/NA	NA/NA	NA/NA	NA
Bulga Village	18/07/2019 22:56	<25/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Gouldsville	18/07/2019 21:22	30/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd	18/07/2019 21:21	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd West	18/07/2019 21:01	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Long Point	18/07/2019 21:00	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
South Bulga	19/07/2019 00:21	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Wambo Road	18/07/2019 21:44	26/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, 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; and

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.

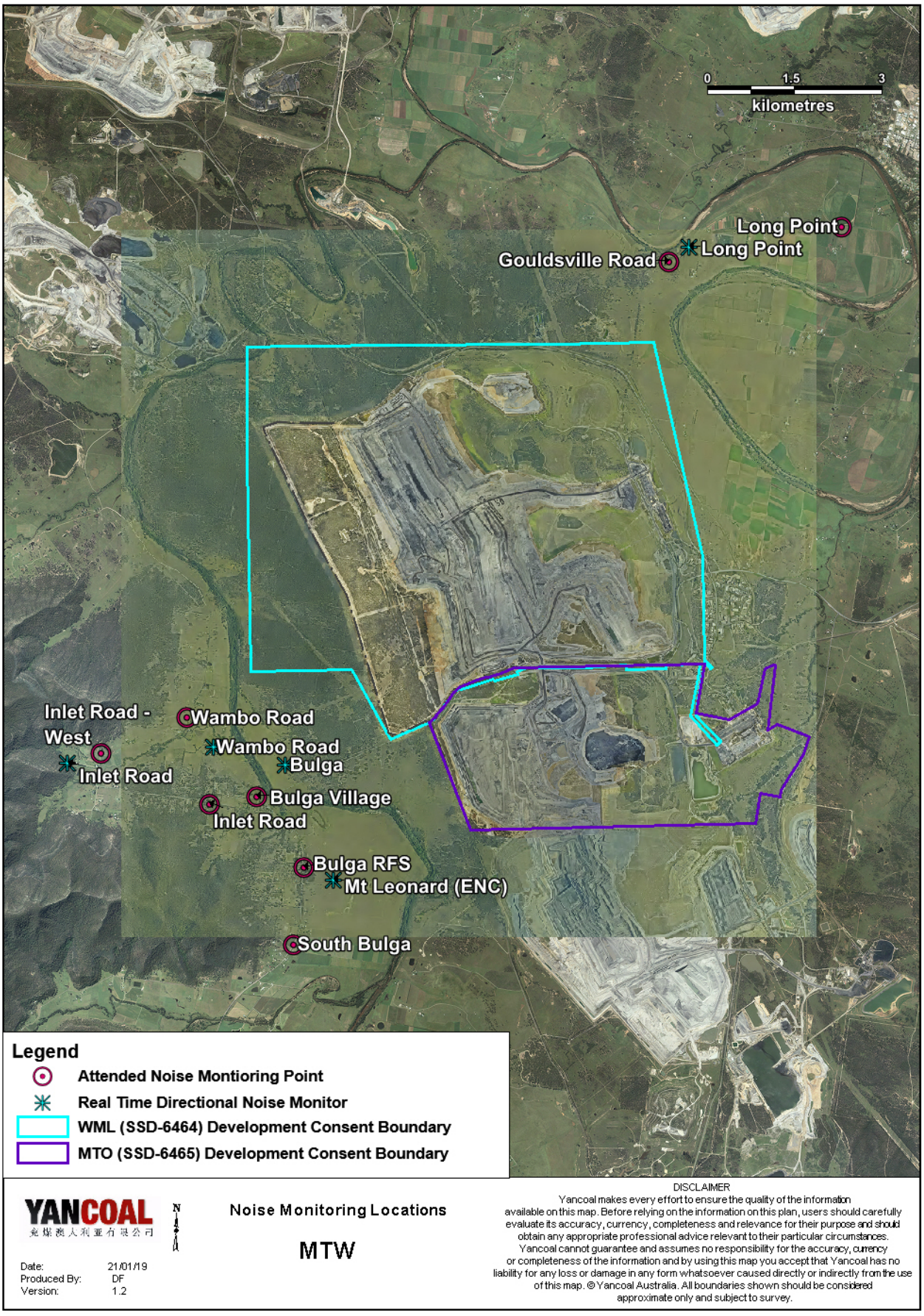


Figure 16: Noise Monitoring Location Plan

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 July are provided in **Table 8**.

Table 8: Supplementary Attended Noise Monitoring Data – July 2019

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
745	10	6	1.3

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

6.0 OPERATIONAL DOWNTIME

During July, a total of 413 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**.

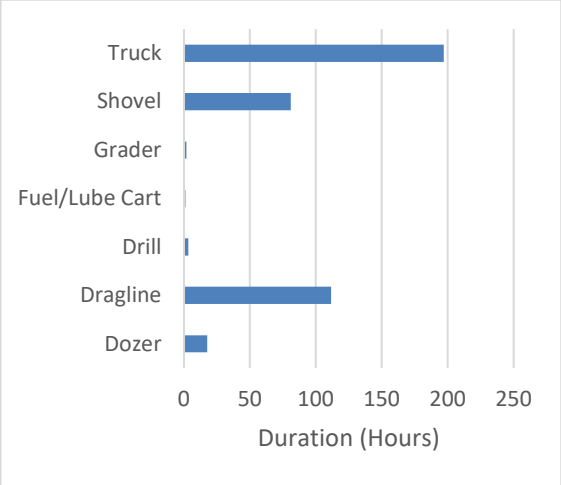


Figure 17: Operational Downtime by Equipment Type – July 2019

7.0 REHABILITATION

During July 2019, 24.0 Ha of land was released, 10.3 Ha of land was bulk shaped, 13.6 Ha of land was top soiled, 8.8 Ha of land was composted and 0.1 Ha of land was rehabilitated.

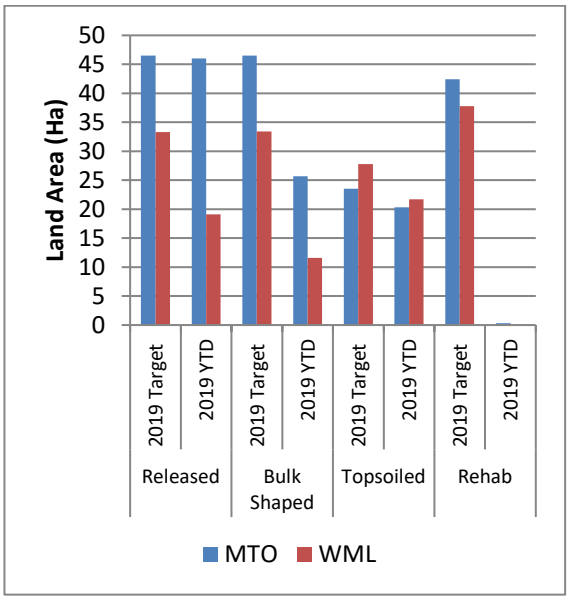


Figure 18: Rehabilitation YTD – July 2019

8.0 ENVIRONMENTAL INCIDENTS

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

9.0 COMPLAINTS

During the reporting period 32 complaints were received. Details of these complaints are shown in **Table 9** below.

Table 9: Complaints Summary YTD

	Noise	Dust	Blast	Lighting	Other	Total
January	7	6	9	3	0	25
February	14	16	11	2	0	43
March	20	8	4	2	0	34
April	15	5	3	6	0	29
May	15	8	6	3	0	32
June	13	17	5	0	1	36
July	10	16	3	0	3	32
August						
September						
October						
November						
December						
Total	94	76	41	16	4	231

Appendix A: Meteorological Data

Table 10: Meteorological Data – Charlton Ridge Meteorological Station –July 2019

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)
1/07/2019	17	0	82	19	176	1.5	0
2/07/2019	20	2	79	27	254	2.3	0
3/07/2019	18	4	96	43	173	2.7	5.4
4/07/2019	16	10	97	78	169	3.1	1.8
5/07/2019	17	9	96	64	153	2.8	0.4
6/07/2019	17	9	98	63	161	2.1	0.4
7/07/2019	19	8	95	50	160	2.1	0.2
8/07/2019	16	8	96	71	266	2.8	0.6
9/07/2019	17	6	97	42	285	3.1	0.2
10/07/2019	16	2	90	34	294	3.2	0
11/07/2019	19	7	71	20	304	5.4	0
12/07/2019	19	7	64	34	306	5.5	0
13/07/2019	16	6	64	21	290	4.7	0
14/07/2019	15	3	67	28	309	5.1	0
15/07/2019	17	7	66	24	283	4.4	0
16/07/2019	19	4	73	29	286	4.3	0
17/07/2019	19	2	81	33	307	4.3	0
18/07/2019	18	5	63	35	299	4.1	0
19/07/2019	18	0	77	28	264	2.9	0
20/07/2019	20	1	83	21	213	1.7	0
21/07/2019	22	1	73	27	269	3.0	0
22/07/2019	21	6	81	35	178	1.7	0.8
23/07/2019	22	5	83	12	287	4.1	0
24/07/2019	21	9	44	23	272	4.2	0
25/07/2019	19	4	85	37	171	1.7	0
26/07/2019	19	4	94	34	254	2.3	0
27/07/2019	20	5	84	35	190	1.6	0
28/07/2019	20	6	91	29	193	1.6	0
29/07/2019	20	3	89	27	243	2.4	0.8
30/07/2019	17	7	95	51	174	2.5	0.6
31/07/2019	17	8	87	48	169	2.9	0

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