Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

July 2018

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Revision History

Version No.	Person Responsible	Document Status	Date
1.0	**Environmental Advisor**	**Draft**	**30/08/2018**
1.1	**Environmental Specialist**	**Final**	**03/09/2018**

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 1st July to 31st July 2018.

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 period is summarised in **Table 1**, the year-to-date trend and historical trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2018	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
July	0.6	158

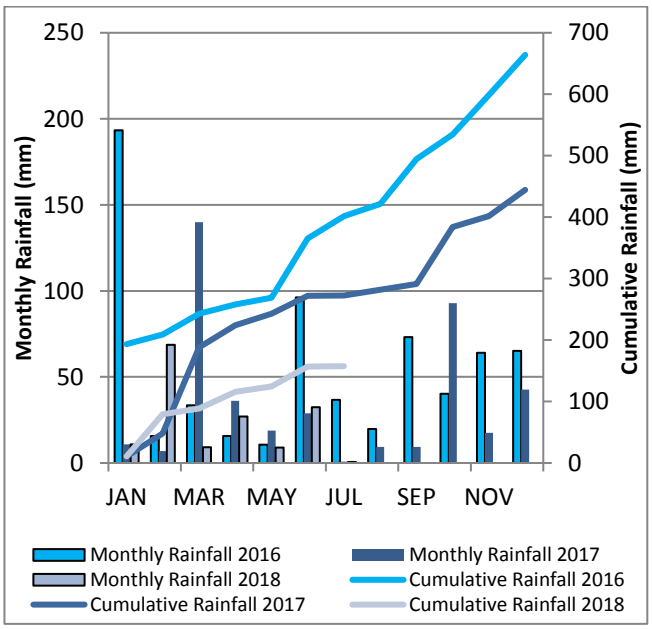

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

Winds from the northwest were dominant throughout the reporting period as shown in **Figure 2.**

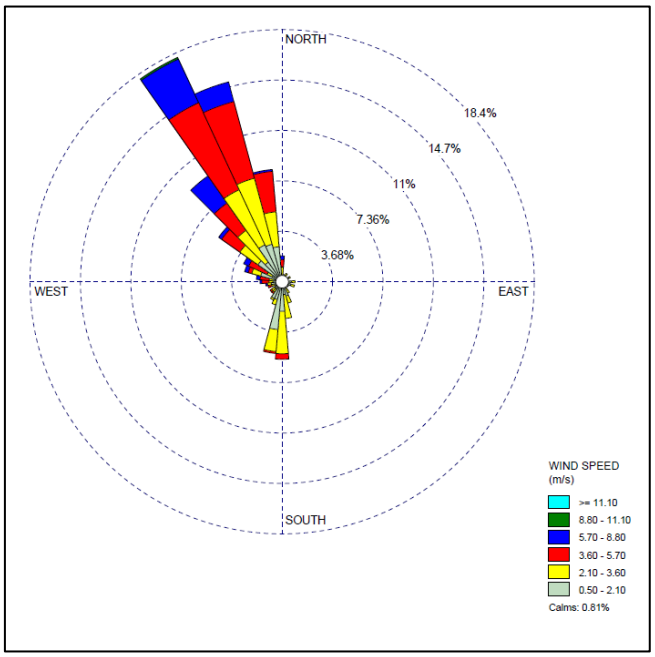

Figure 2: Charlton Ridge Wind Rose – July 2018

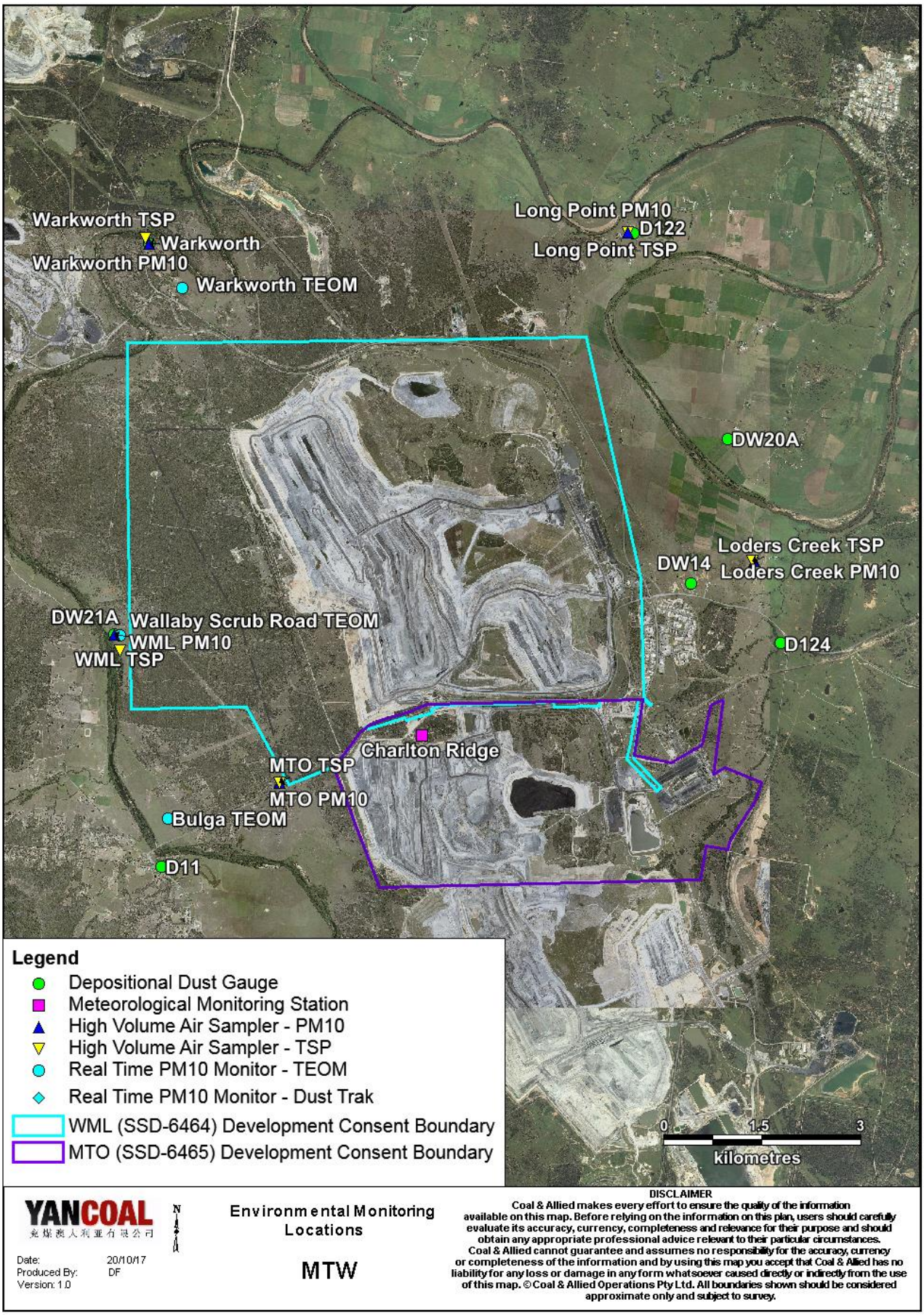

Figure 3: Air Quality Monitoring Locations

2.2 Depositional Dust

To monitor regional 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 D124 monitors recorded monthly results above the long term impact assessment criteria of 4.0 g/m^2 per month. Field notes associated with D122 and D124 confirm the presence of insects and bird droppings. As such the results are considered contaminated and will be excluded from calculation of the annual average.

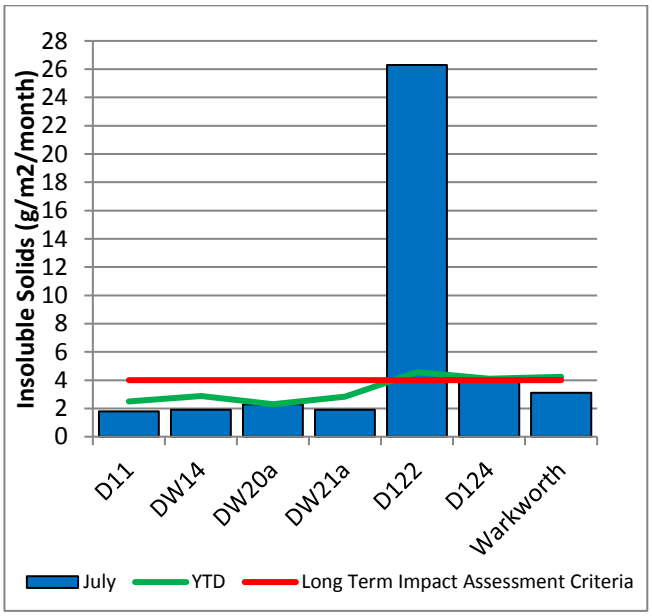

Figure 4: Depositional Dust – July 2018

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 6th, 18th, 24th and 30th July 2018 the Long Point HVAS PM_{10} unit recorded results of 53µg/m^3, 66µg/m^3, 112µg/m^3 and 54µg/m^3 respectively which are greater than the short term (24hr) PM_{10} impact assessment criteria.

Investigations determined that the wind direction was generally not from MTW's angle of influence at Long Point on the 6th, 18th, 24th and 30th July 2018. Accordingly, no further action is required.

On 12th, 18th and 24th July 2018 the Loders Creek HVAS unit recorded results of 51µg/m^3, 68µg/m^3 and 54µg/m^3 respectively which are greater than the short term (24hr) PM_{10} impact assessment criteria.

Investigations indicate that the likely MTW contribution to the results at Long Point on the 12th, 18th and 24th July is less than 66%, 53% and 56% respectively. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

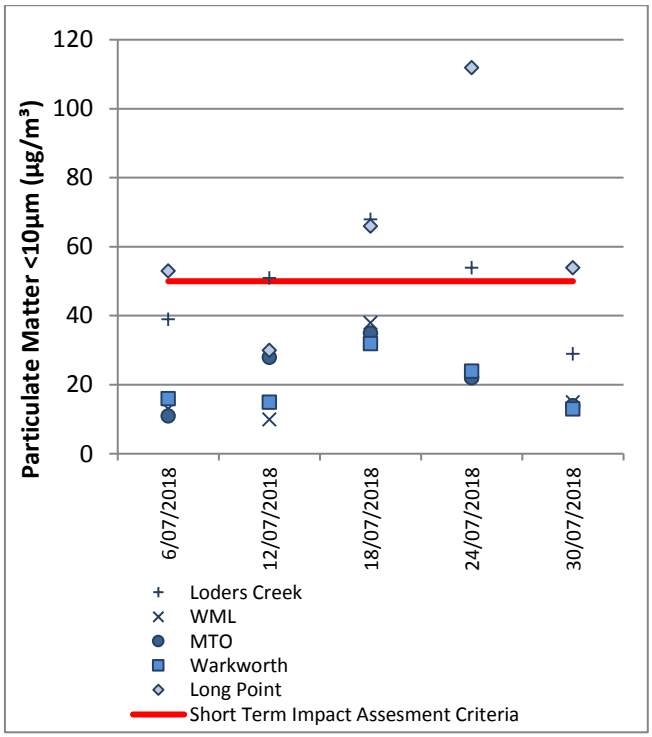

Figure 5: Individual PM10 Results – July 2018

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 2018 Annual Review Report.

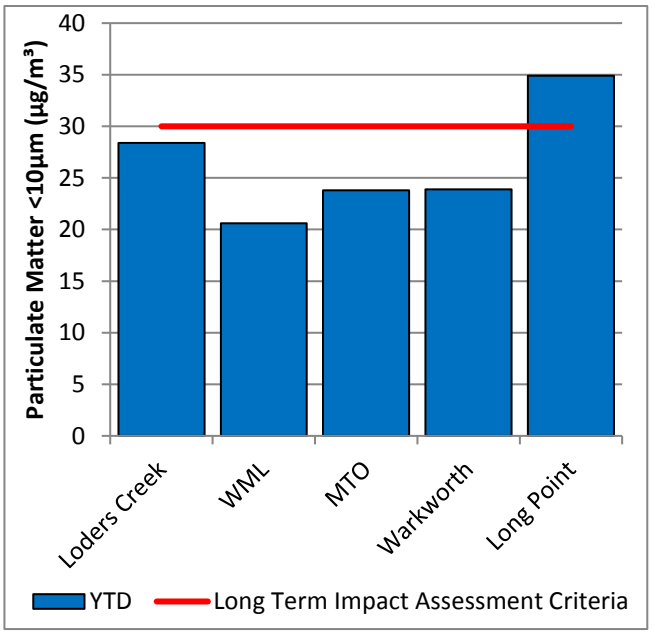

Figure 6: Annual Average PM_{10} – July 2018

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 2018 Annual Review Report.

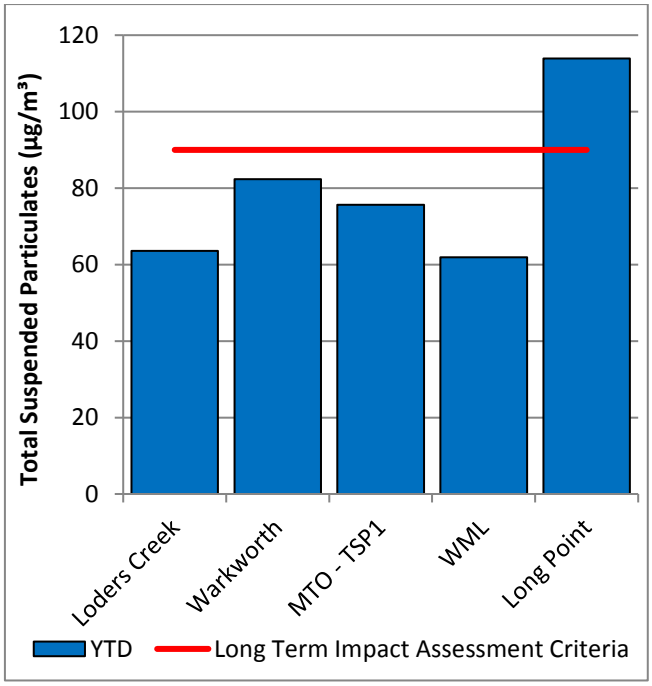

Figure 7: Annual Average Total Suspended Particulates – July 2018

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 alarms 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.

One result recorded elevated levels at the Bulga TEOM (51 µg/m³) which exceeded the short term (24hr) criteria on 28th July 2018. This measurement was assessed for MTW's maximum potential contribution based on meteorological conditions on this day resulting in a maximum estimated contribution of <13µg/m³ from the direction of MTW.

2.3.4 Real Time Alarms for Air Quality

During July, the real time monitoring system generated 100 automated air quality related alerts, including 22 alerts for adverse meteorological conditions and 78 alerts for elevated PM_{10} levels.

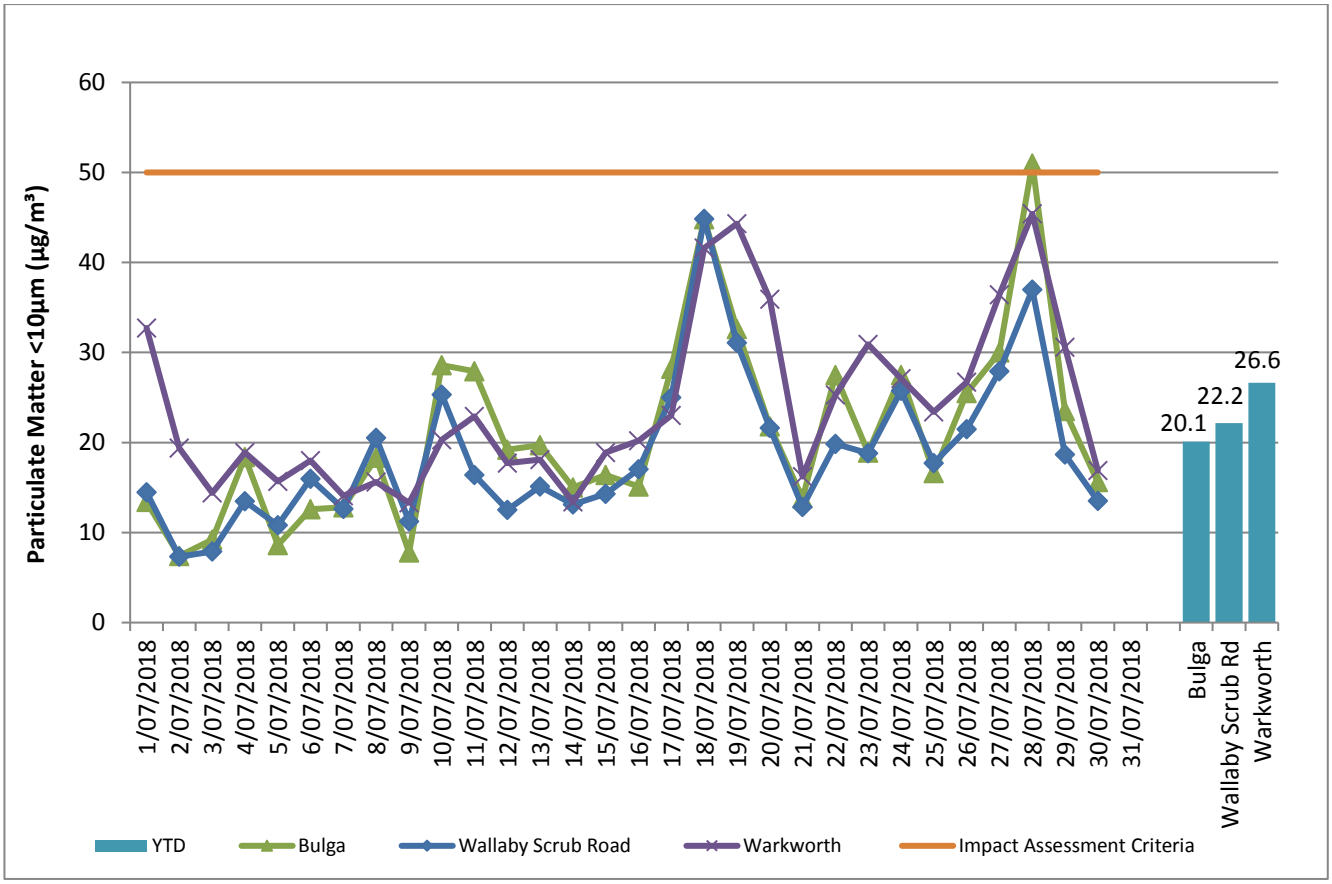

Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – July 2018

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 2018 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 2018 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 2018, 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**.

Airblast Overpressure and Ground Vibration results are not available for blast w28-bfe-ptg1 on 5th July 2018. The data is unavailable as the peak vibration level was below the trigger threshold of 0.2mm/sec which triggers the automated capture of blast results. Blast results were also not manually captured within 20 days of the blast event, which is the storage limit of the blast monitors. Details regarding the miss capture will be outlined in the Annual Return, to be provided to the EPA.

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.

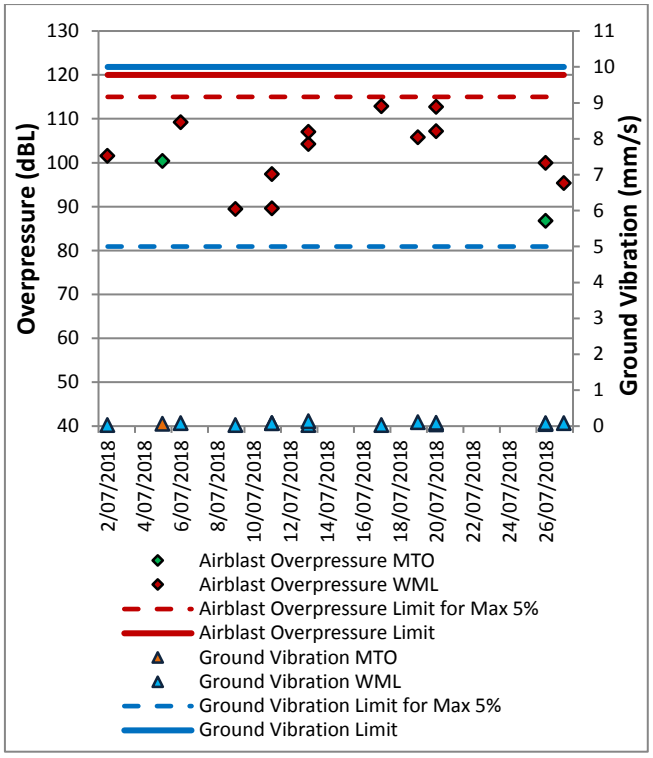

Figure 9: Abbey Green Blast Monitoring Results – July 2018

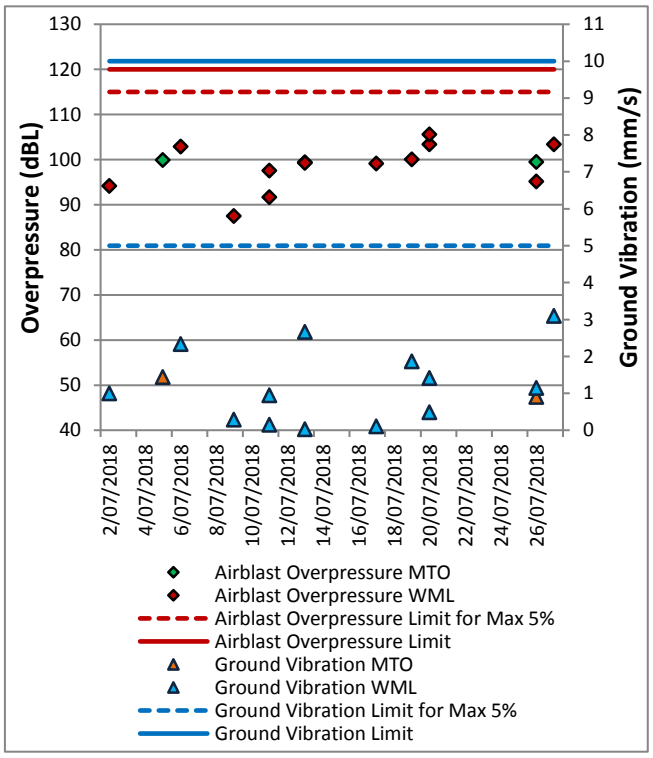

Figure 10: Bulga Village Blast Monitoring Results – July 2018

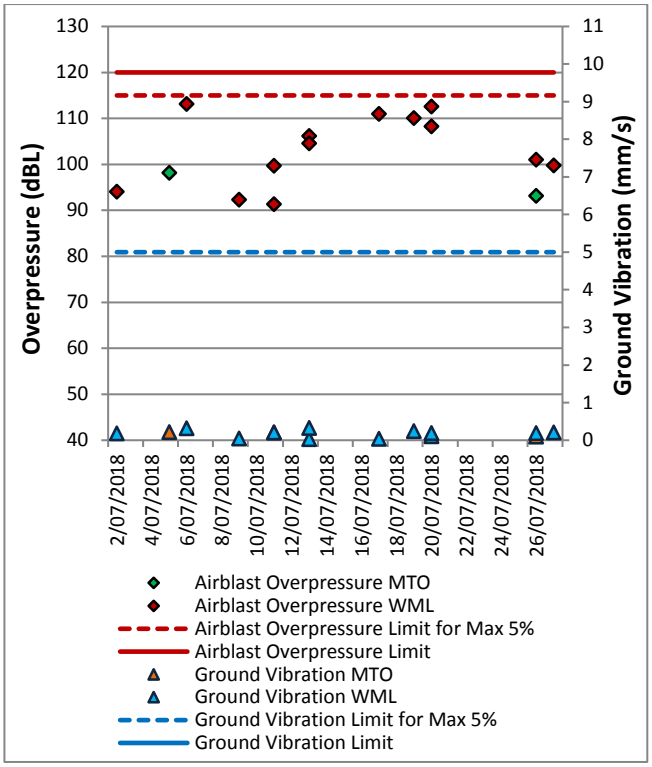

Figure 11: MTIE Blast Monitoring Results – July 2018

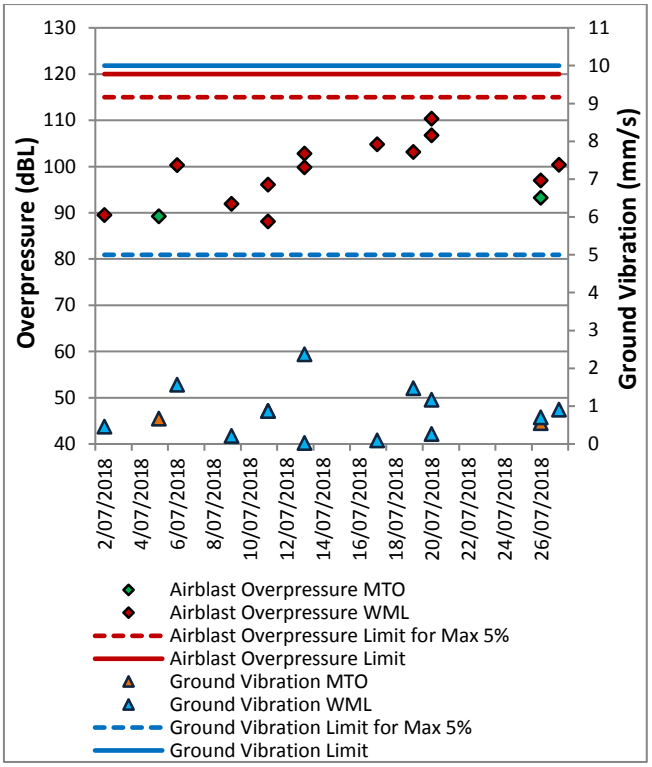

Figure 13: Wambo Road Blast Monitoring Results – July 2018

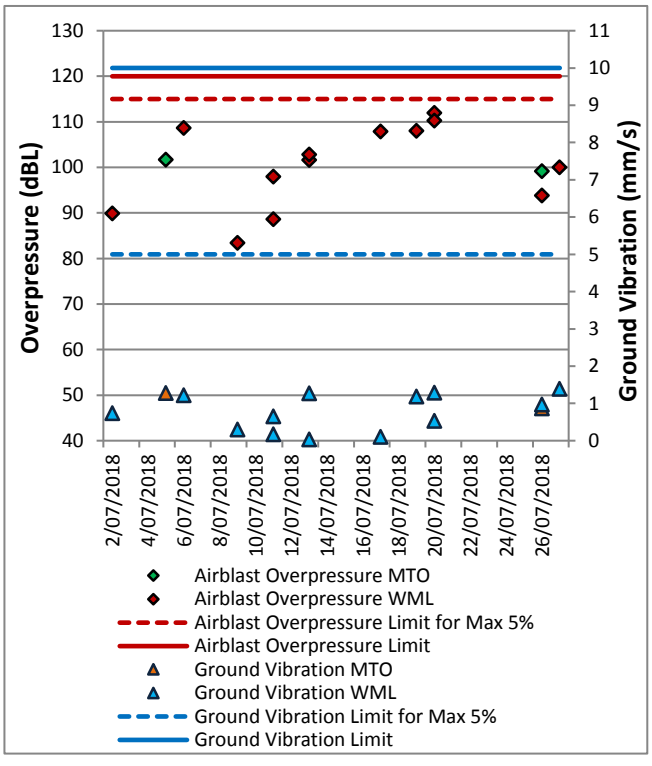

Figure 12: Wollemi Peak Road Blast Monitoring Results – July 2018

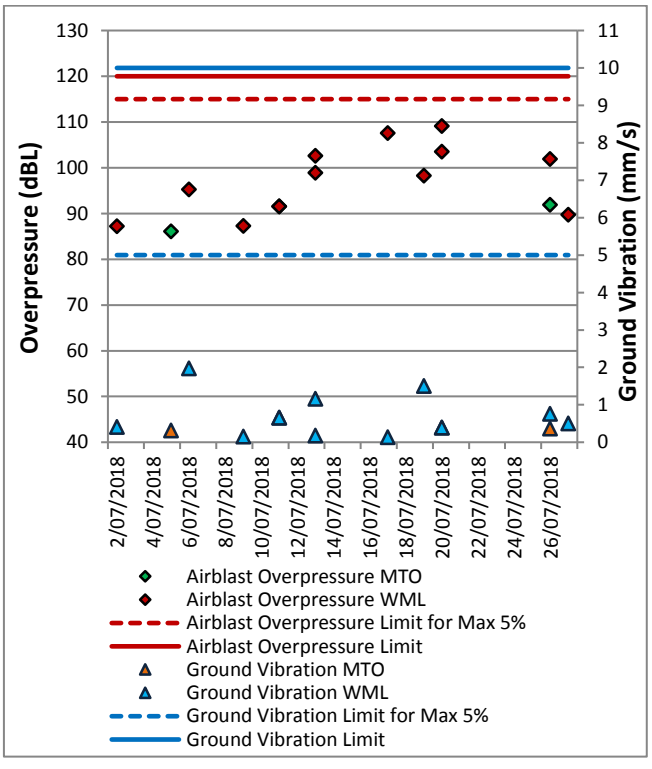

Figure 14: Warkworth Blast Monitoring Results – July 2018

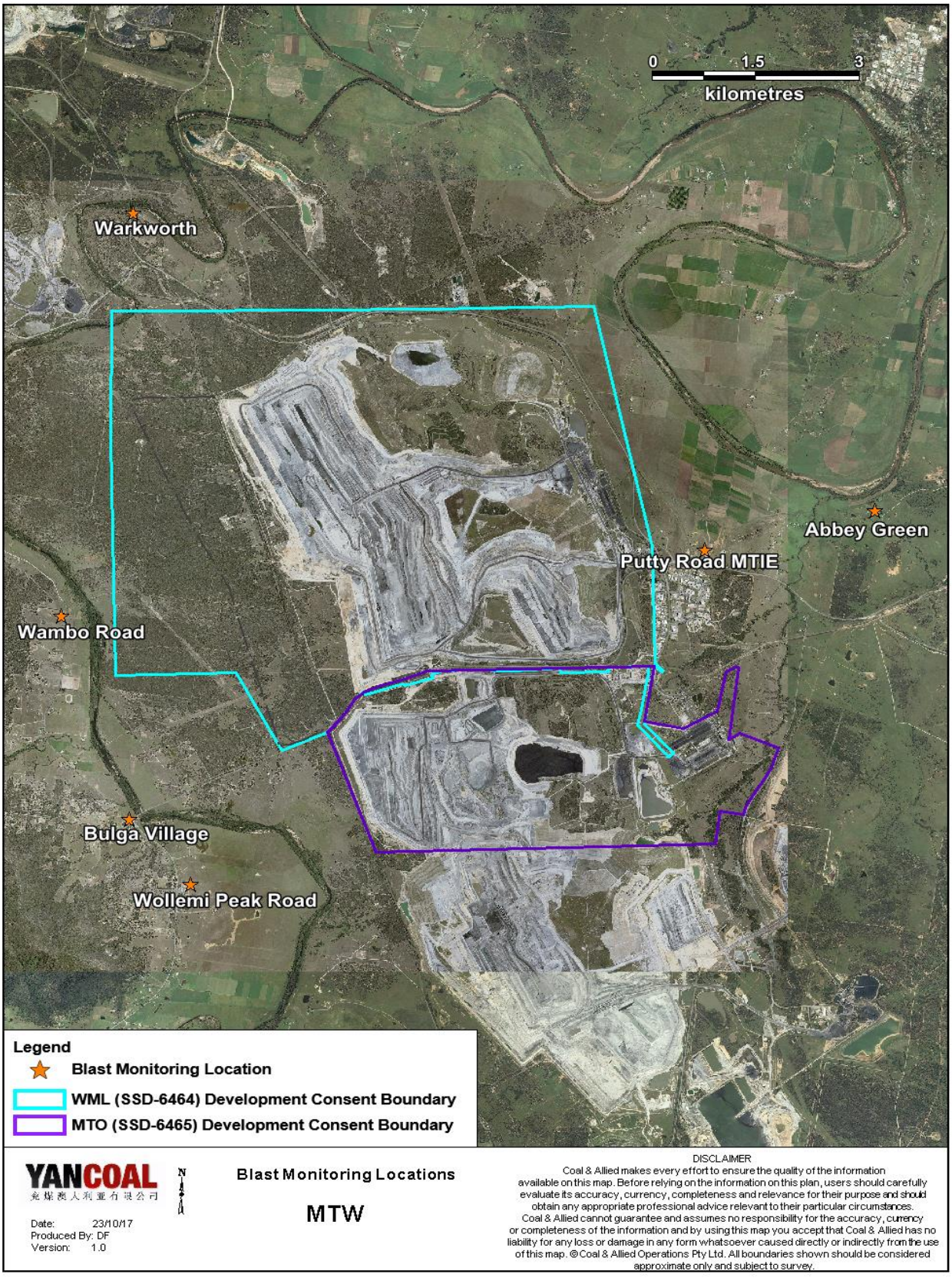

Figure 15: MTW Blast Monitoring Location Plan

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 Report. 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 9 July 2018. 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 – July 2018

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB(A)	Criterion Applies?[1,5]	WML L_{Aeq} dB[2,4]	Exceedance[3]
Bulga RFS	9/07/2018 21:00	1.3	E	37	Yes	NM	Nil
Bulga Village	9/07/2018 23:33	3.1	D	38	No	32	NA
Gouldsville	9/07/2018 23:16	2.8	D	38	Yes	31	Nil
Inlet Rd	9/07/2018 21:32	1.7	D	37	Yes	35	Nil
Inlet Rd West	9/07/2018 21:00	1.3	E	35	Yes	32	Nil
Long Point	9/07/2018 22:47	1.9	D	35	Yes	IA	Nil
South Bulga	9/07/2018 21:28	1.7	D	35	Yes	NM	Nil
Wambo Road	9/07/2018 23:04	1.9	D	38	Yes	31	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;
2. Estimated or measured LAeq,15minute attributed to WML;
3. NA means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

Table 4: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – July 2018

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB(A)	Criterion Applies?[1,5]	WML $L_{A1,\ 1min}$ dB[2,4]	Exceedance[3]
Bulga RFS	9/07/2018 21:00	1.3	E	47	Yes	31	Nil
Bulga Village	9/07/2018 23:33	3.1	D	48	No	37	NA
Gouldsville	9/07/2018 23:16	2.8	D	48	Yes	34	Nil
Inlet Rd	9/07/2018 21:32	1.7	D	47	Yes	42	Nil
Inlet Rd West	9/07/2018 21:00	1.3	E	45	Yes	41	Nil
Long Point	9/07/2018 22:47	1.9	D	45	Yes	IA	Nil
South Bulga	9/07/2018 21:28	1.7	D	45	Yes	NM	Nil
Wambo Road	9/07/2018 23:04	1.9	D	48	Yes	35	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;
2. Estimated or measured LA1,1minute attributed to Warkworth mine (WML);
3. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable. NA (not applicable) in criterion column means criterion not specified for this location;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

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 2018

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB	Criterion Applies?[1,5]	MTO L_{Aeq} dB[2,4]	Exceedance[3]
Bulga RFS	9/07/2018 21:00	1.3	E	37	Yes	IA	Nil
Bulga Village	9/07/2018 23:33	3.1	D	38	No	IA	NA
Gouldsville	9/07/2018 23:16	2.8	D	35	Yes	IA	Nil
Inlet Rd	9/07/2018 21:32	1.7	D	37	Yes	NM	Nil
Inlet Rd West	9/07/2018 21:00	1.3	E	35	Yes	NM	Nil
Long Point	9/07/2018 22:47	1.9	D	35	Yes	IA	Nil
South Bulga	9/07/2018 21:28	1.7	D	36	Yes	IA	Nil
Wambo Road	9/07/2018 23:04	1.9	D	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;
2. Estimated or measured LAeq,15minute attributed to MTO;
3. NA means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

Table 6: $L_{A1, 1Minute}$ Mount Thorley - Impact Assessment Criteria – July 2018

Location	Date and Time	Wind Speed (m/s)[5]	Stability Class	Criterion dB	Criterion Applies?[1,5]	MTO $L_{A1, 1min}$ dB[2,4]	Exceedance[3]
Bulga RFS	9/07/2018 21:00	1.3	E	47	Yes	IA	Nil
Bulga Village	9/07/2018 23:33	3.1	D	48	No	IA	NA
Gouldsville	9/07/2018 23:16	2.8	D	45	Yes	IA	Nil
Inlet Rd	9/07/2018 21:32	1.7	D	47	Yes	NM	Nil
Inlet Rd West	9/07/2018 21:00	1.3	E	45	Yes	NM	Nil
Long Point	9/07/2018 22:47	1.9	D	45	Yes	IA	Nil
South Bulga	9/07/2018 21:28	1.7	D	46	Yes	IA	Nil
Wambo Road	9/07/2018 23:04	1.9	D	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;
2. Estimated or measured LA1,1minute attributed to Mt Thorley Operations (MTO);
3. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable. NA (not applicable) in criterion column means criterion not specified for this location;
4. Bolded results in red are possible exceedances of relevant criteria; and
5. Criterion may or may not apply due to rounding of meteorological data values.

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 2018

Location	Date and Time	Measured Site Only LA_{eq} dB (WML/MTO)	Site Only L_{Ceq} dB[4] (WML/MTO)	Site Only LCeq – LAeq dB[1,4] (WML/MTO)	Result Max exceedance of ref spectrum dB (WML/MTO)[2,3,4]	Penalty dB(A)	Exceedance
Bulga RFS	9/07/2018 21:00	NM/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Bulga Village	9/07/2018 23:33	32/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Gouldsville	9/07/2018 23:16	31/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd	9/07/2018 21:32	35/NM	51/NA	16/NA	0/NA	Nil/NA	NA
Inlet Rd West	9/07/2018 21:00	32/NM	50/NA	18/NA	0/NA	Nil/NA	NA
Long Point	9/07/2018 22:47	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
South Bulga	9/07/2018 21:28	NM/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Wambo Road	9/07/2018 23:04	31/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA

Notes:
1. As per NPfI, if LCeq – LAeq >= 15 dB further assessment of low frequency noise required.
2. 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;
3. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded; and
4. 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.

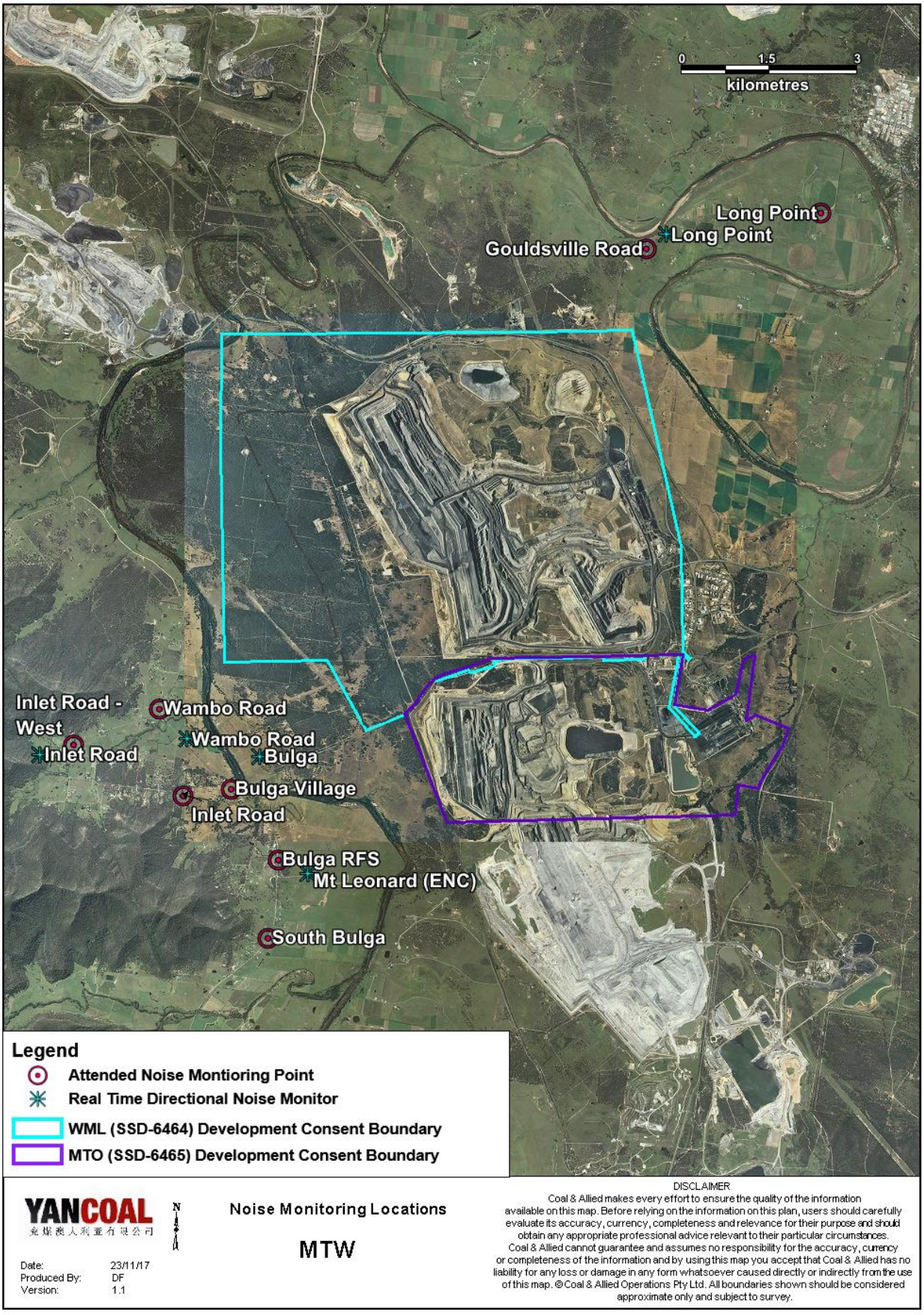

Figure 16: Noise Monitoring Location Plan

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**.

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Table 8: Supplementary Attended Noise Monitoring Data – July 2018

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
644	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 July, a total of 1126 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**.

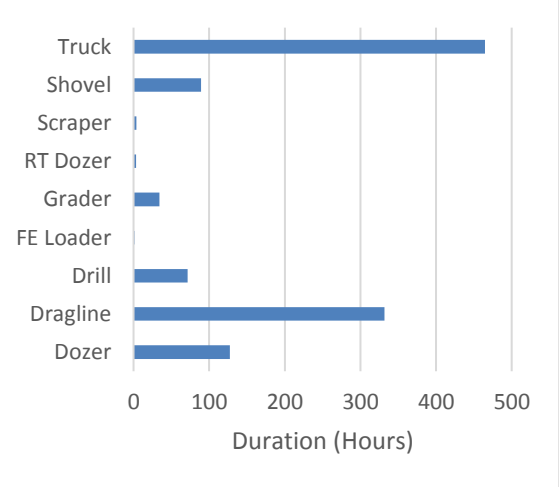

Figure 17: Operational Downtime by Equipment Type – July 2018

7.0 REHABILITATION

During July 2018, 1.3 Ha of land was released for rehabilitation, 1.6 Ha of land was bulk shaped, 3.9 Ha of land was topsoiled, 7.5 Ha of land was composted and 9.0 Ha of land was rehabilitated.

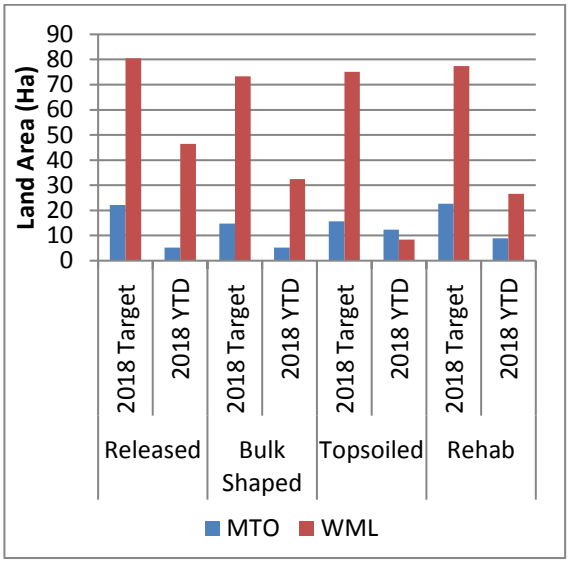

Figure 18: Rehabilitation YTD – July 2018

8.0 ENVIRONMENTAL INCIDENTS

There was one reportable environmental incident recorded during the reporting period.

Airblast Overpressure and Ground Vibration results are unavailable for blast w28-bfe-ptg1 on 5th July 2018. The data is unavailable as the peak vibration level was below the trigger threshold of 0.2mm/sec which triggers the automated capture of blast results. Blast results were also not manually captured within 20 days of the blast event, which is the storage limit of the blast monitors. Details regarding the miss capture will be outlined in the Annual Return, to be provided to the EPA.

9.0 COMPLAINTS

During the reporting period 29 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	9	6	15	1	0	31
February	7	4	3	3	0	17
March	24	0	0	3	0	27
April	8	3	9	3	2	25
May	13	11	3	3	0	30
June	14	2	8	0	0	24
July	9	12	8	0	0	29
August						
September						
October						
November						
December						
Total	84	38	46	13	2	183

Note: The method of capturing complaints was amended in July 2018 and backdated to the start of the year. As a result, the monthly complaint data and YTD figures have been adjusted when compared to previous reports.

Appendix A: Meteorological Data

Table 10: Meteorological Data – Charlton Ridge Meteorological Station – July 2018

Date	Air Temperature Maximum (°C)	Air Temperature Minimum (°C)	Relative Humidity Maximum (%)	Relative Humidity Minimum (%)	Solar Radiation Maximum (W/Sq. M)	Wind Direction Average (°)	Wind Speed Average (m/sec)	Rainfall(mm)
1/07/2018	15	1	92	46	639	171	1.6	0.0
2/07/2018	14	9	96	69	385	171	2.4	0.0
3/07/2018	17	8	93	61	842	177	2.3	0.2
4/07/2018	18	6	96	64	633	188	1.4	0.0
5/07/2018	24	7	98	43	507	279	2.2	0.0
6/07/2018	25	11	73	31	752	289	5.2	0.0
7/07/2018	16	6	71	31	642	303	4.5	0.0
8/07/2018	15	6	67	42	599	319	6.9	0.0
9/07/2018	17	4	84	31	569	221	2.4	0.0
10/07/2018	16	3	84	41	560	177	1.5	0.0
11/07/2018	18	2	95	34	550	185	1.8	0.0
12/07/2018	18	2	96	24	541	257	2.0	0.0
13/07/2018	17	3	66	28	566	274	2.9	0.0
14/07/2018	16	1	78	31	579	276	2.6	0.0
15/07/2018	17	-1	76	14	592	299	2.9	0.0
16/07/2018	17	1	78	16	601	318	3.8	0.0
17/07/2018	21	5	38	12	601	302	4.7	0.0
18/07/2018	22	7	54	19	584	284	3.6	0.0
19/07/2018	23	3	70	15	604	301	2.6	0.0
20/07/2018	20	5	55	20	777	289	4.2	0.0
21/07/2018	16	4	64	26	633	269	3.4	0.0
22/07/2018	17	1	73	21	621	218	1.8	0.0
23/07/2018	18	0	79	17	634	270	2.5	0.0
24/07/2018	23	6	41	14	628	294	4.0	0.0
25/07/2018	22	8	50	20	626	286	3.2	0.0
26/07/2018	21	5	64	25	623	270	2.7	0.0
27/07/2018	21	4	76	27	614	172	1.6	0.0
28/07/2018	22	6	69	24	739	192	1.5	0.0
29/07/2018	22	8	82	36	800	258	3.7	0.4
30/07/2018	18	7	57	25	695	300	4.1	0.0
31/07/2018	19	6	58	23	709	299	4.4	0.0

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