Monthly Environmental Monitoring Report

Yancoal Mount Thorley Warkworth

May 2018

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Revision History

Version No.	Person Responsible	Document Status	Date
1.0	**Environmental Advisor**	**Draft**	**28/06/2018**
1.1	**Environmental Specialist**	**Final**	**29/06/2018**

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 May to 31st May 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)
May	9	125

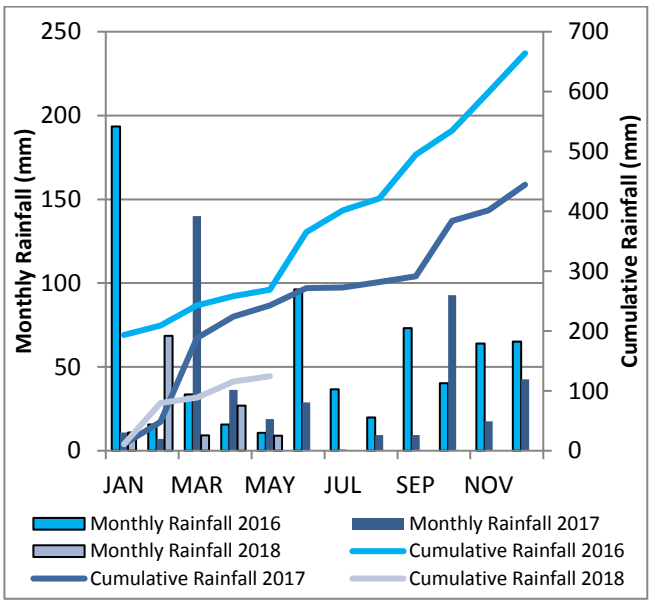

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

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

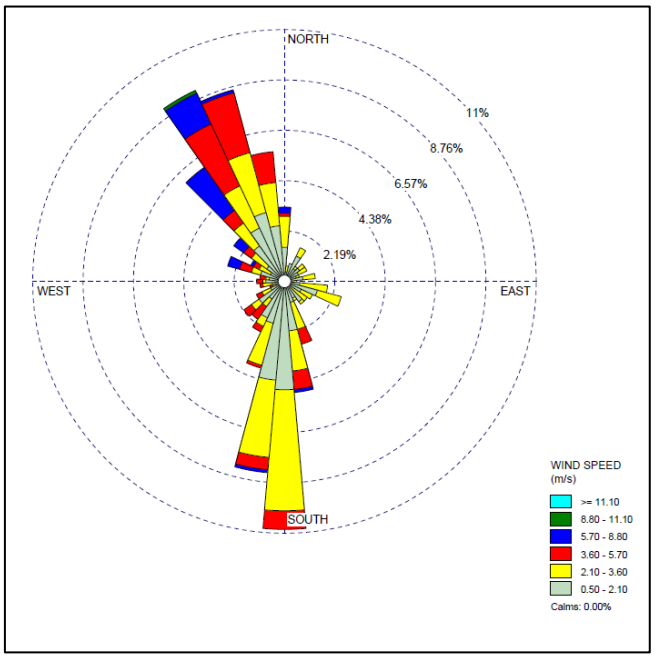

Figure 2: Charlton Ridge Wind Rose – May 2018

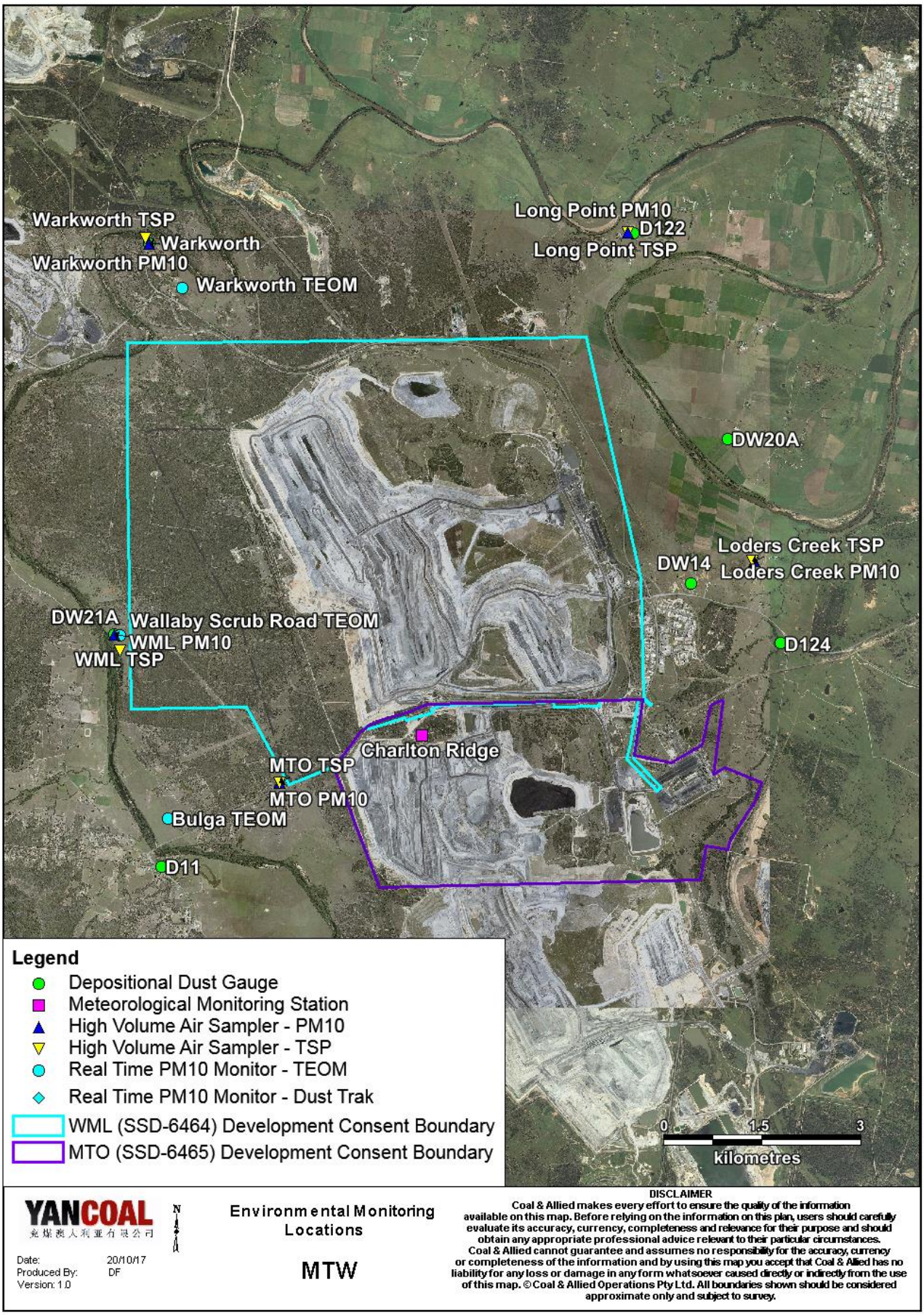

Figure 3: Air Quality Monitoring Locations

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 D11, 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. There is no evidence to suggest that the D11 result is contaminated. Accordingly, the result will be included in the annual average calculation.

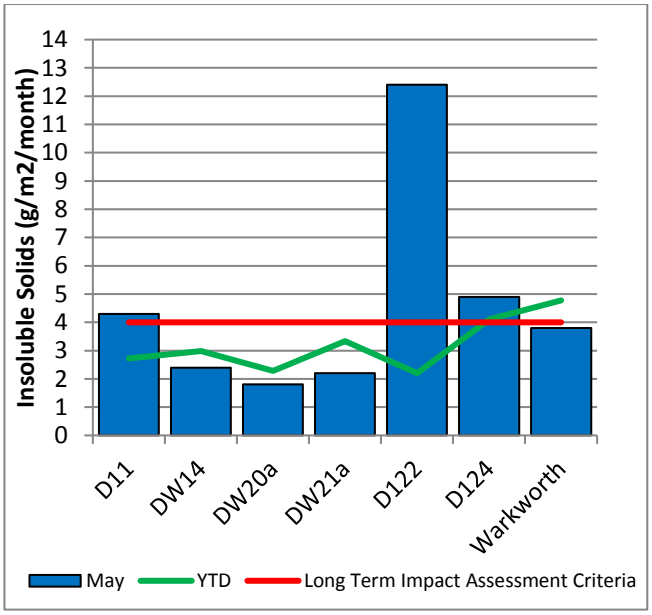

Figure 4: Depositional Dust – May 2018

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 19th May 2018 the Long Point HVAS PM_{10} unit recorded a result of 52 µg/m^3, which is greater than the short term (24hr) PM_{10} impact assessment criteria.

Investigation indicates that the likely MTW contribution to the results at Long Point on the 19th May is less than 40%. Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

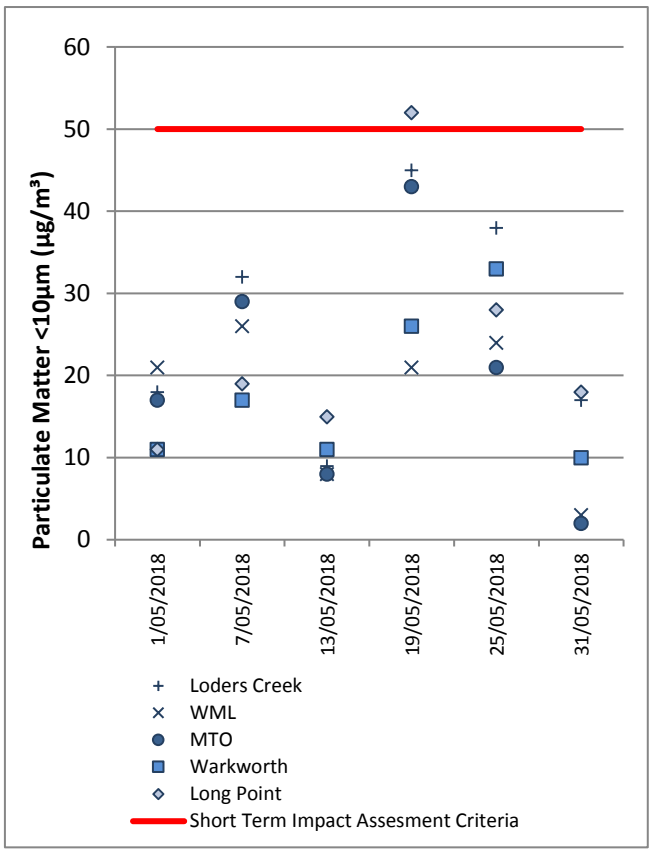

Figure 5: Individual PM10 Results – May 2018

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.

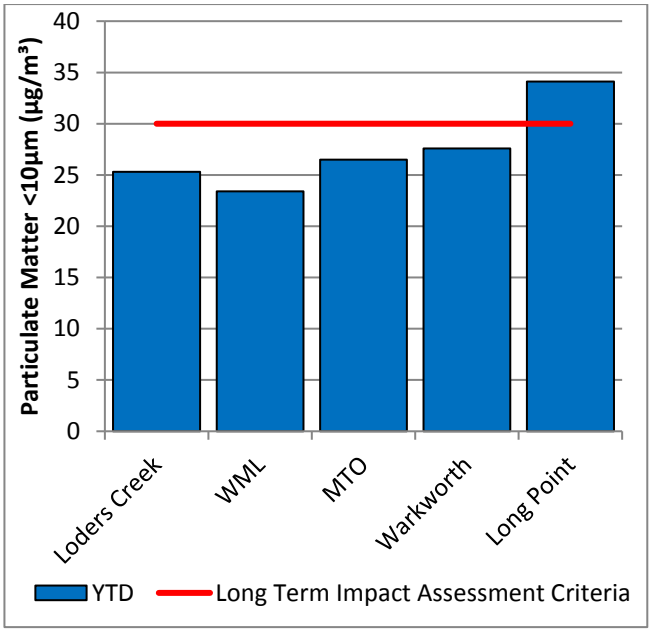

Figure 6: Annual Average PM_{10} – May 2018

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.

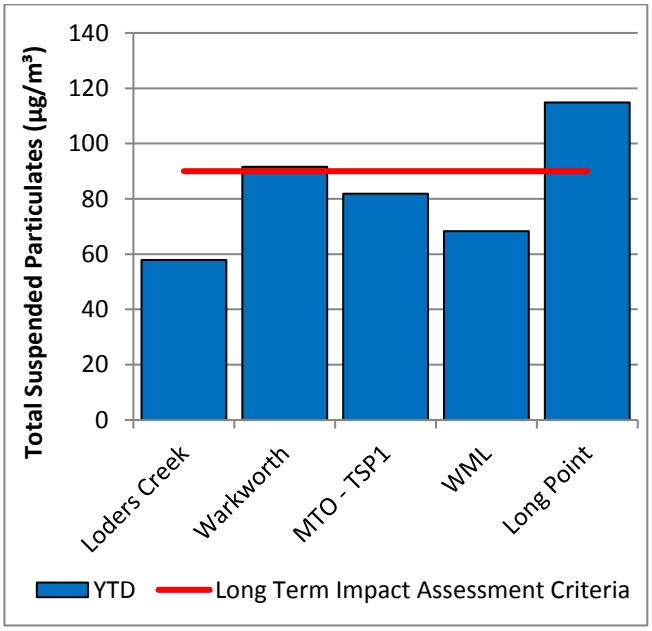

Figure 7: Annual Average Total Suspended Particulates – May 2018

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.

Data was not available on 7th to 9th May 2018 from the Wallaby Scrub Road monitor due to a communications issue. Data was also not available on 31st May 2018 from the Warkworth monitor due to equipment issues.

2.3.4 Real Time Alarms for Air Quality

During May, the real time monitoring system generated 74 automated air quality related alerts, including 11 alerts for adverse meteorological conditions and 63 alerts for elevated PM_{10} levels.

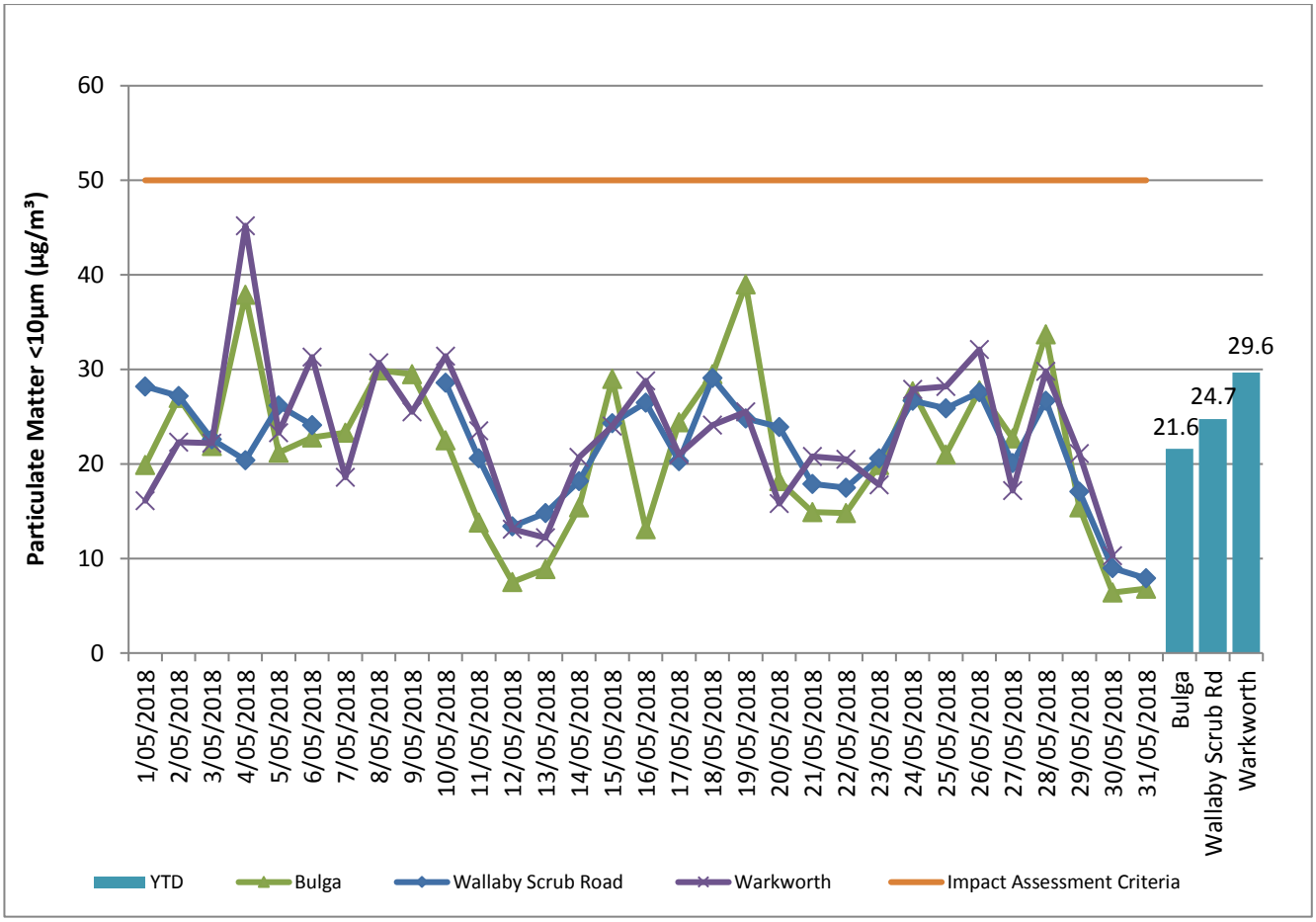

Figure 8: Real Time PM_{10} daily 24hr average (line graphs) and YTD annual average (column graphs) – May 2018

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. Other Hunter River tributaries are also monitored.

Results of monitoring are reported quarterly, next available in the June 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 June 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 May 2018, 24 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 one blast exceeded the 115 dB(L) threshold for airblast overpressure at the Putty Road MTIE blast monitor on 22 May 2018 at 13:30. No blast exceeded the 5mm/s criteria for ground vibration.

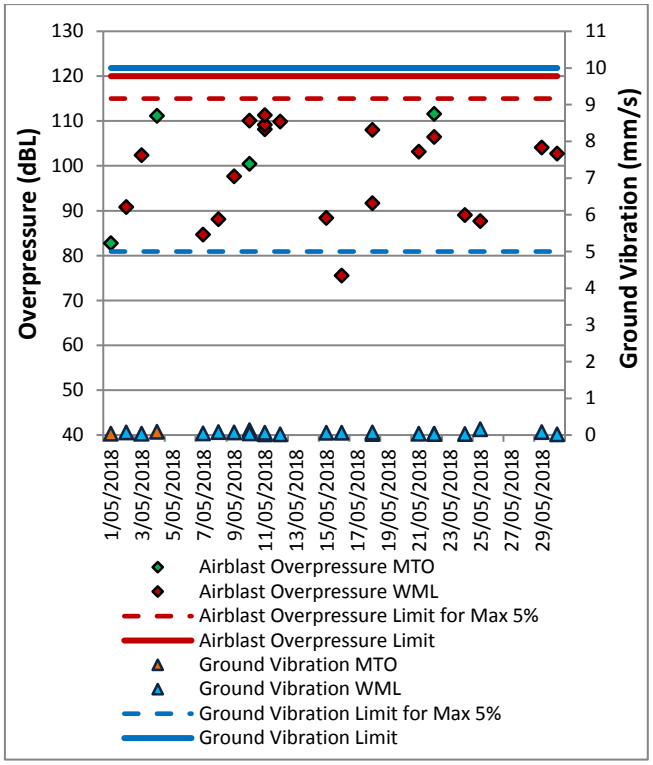

Figure 9: Abbey Green Blast Monitoring Results – May 2018

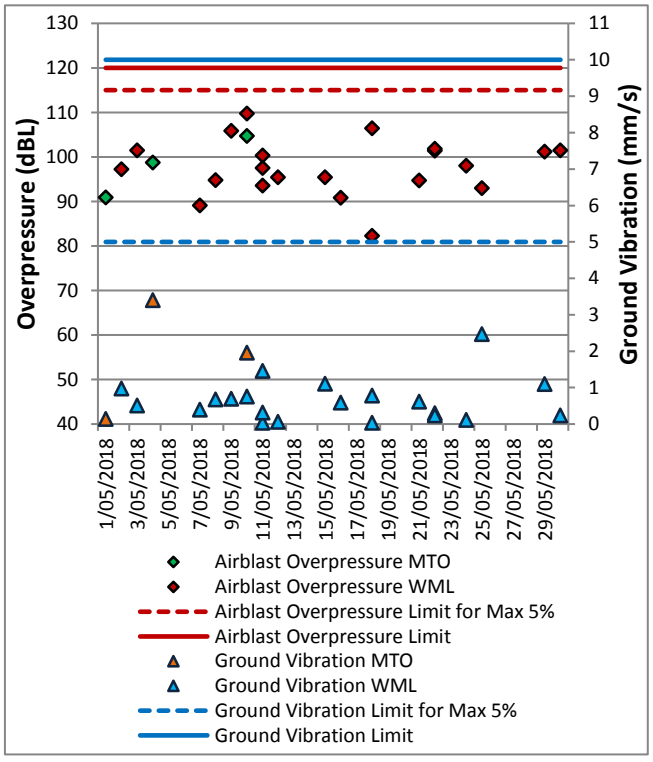

Figure 10: Bulga Village Blast Monitoring Results – May 2018

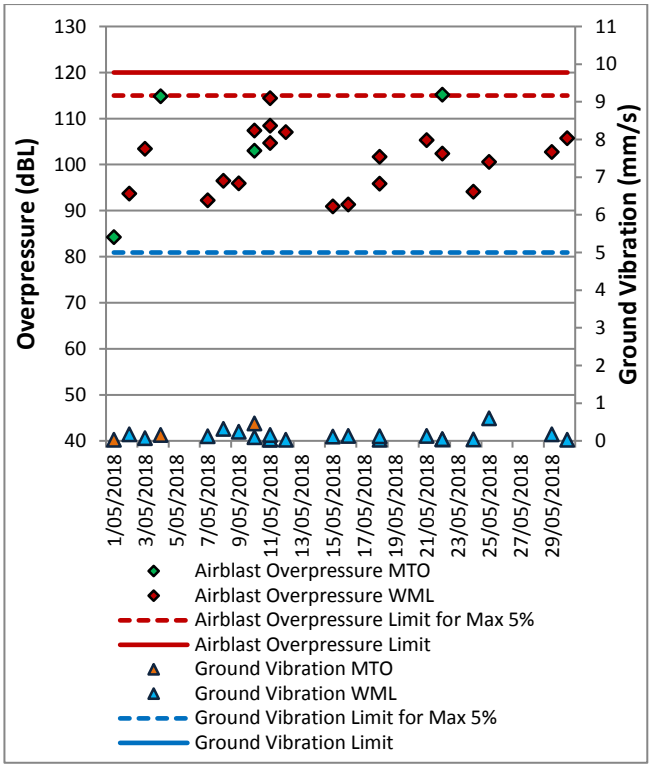

Figure 11: MTIE Blast Monitoring Results – May 2018

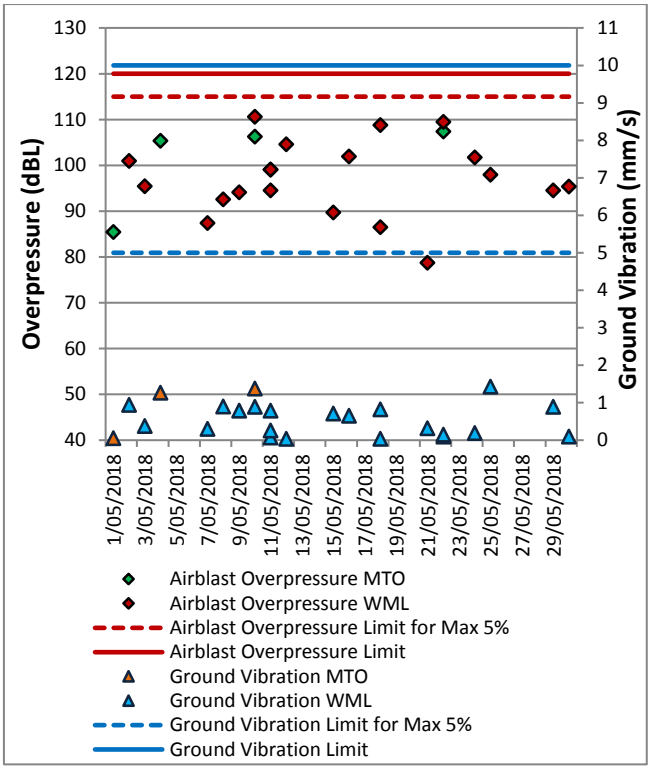

Figure 13: Wambo Road Blast Monitoring Results – May 2018

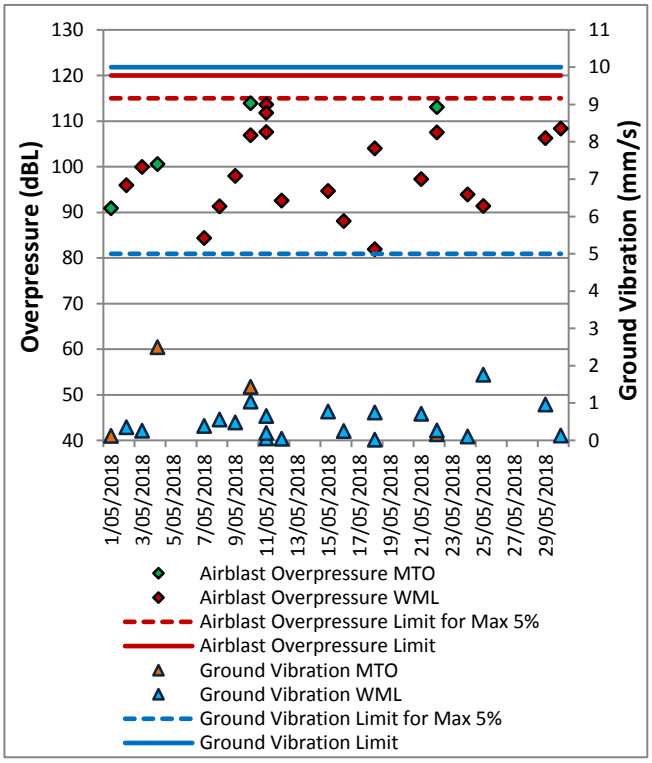

Figure 12: Wollemi Peak Road Blast Monitoring Results – May 2018

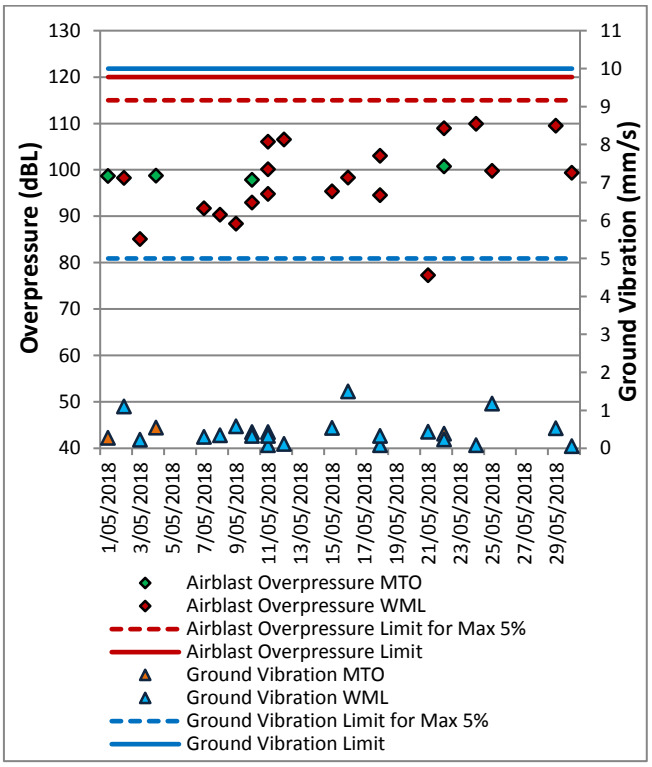

Figure 14: Warkworth Blast Monitoring Results – May 2018

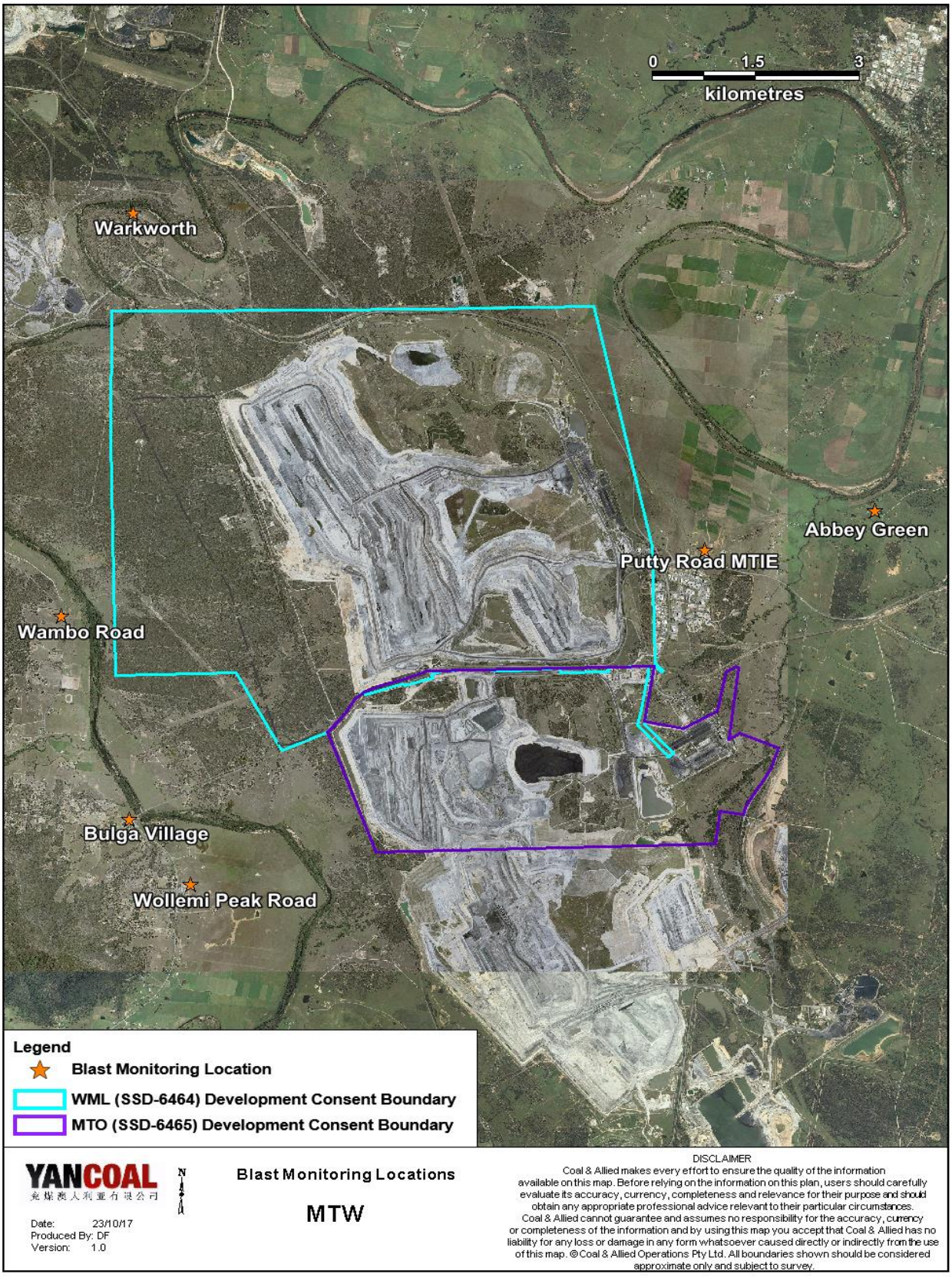

Figure 15: MTW Blast Monitoring Location Plan

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 17 May 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 – May 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	17/05/2018 21:00	1.5	E	37	Yes	IA	Nil
Bulga Village	17/05/2018 23:23	2.2	E	38	Yes	<30	Nil
Gouldsville	18/05/2018 0:47	1.5	F	38	Yes	29	Nil
Inlet Rd	17/05/2018 21:23	1.6	F	37	Yes	32	Nil
Inlet Rd West	17/05/2018 21:00	1.5	E	35	Yes	28	Nil
Long Point	18/05/2018 0:20	1.6	F	35	Yes	<25	Nil
South Bulga	17/05/2018 21:24	1.9	E	35	Yes	IA	Nil
Wambo Road	17/05/2018 23:02	2.2	E	38	Yes	<30	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 – May 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	17/05/2018 21:00	1.5	E	47	Yes	IA	Nil
Bulga Village	17/05/2018 23:23	2.2	E	48	Yes	32	Nil
Gouldsville	18/05/2018 0:47	1.5	F	48	Yes	33	Nil
Inlet Rd	17/05/2018 21:23	1.6	F	47	Yes	37	Nil
Inlet Rd West	17/05/2018 21:00	1.5	E	45	Yes	32	Nil
Long Point	18/05/2018 0:20	1.6	F	45	Yes	<25	Nil
South Bulga	17/05/2018 21:24	1.9	E	45	Yes	IA	Nil
Wambo Road	17/05/2018 23:02	2.2	E	48	Yes	32	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 – May 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	17/05/2018 21:00	1.5	E	37	Yes	36	Nil
Bulga Village	17/05/2018 23:23	2.2	E	38	Yes	<30	Nil
Gouldsville	18/05/2018 0:47	1.5	F	35	Yes	IA	Nil
Inlet Rd	17/05/2018 21:23	1.6	F	37	Yes	<30	Nil
Inlet Rd West	17/05/2018 21:00	1.5	E	35	Yes	NM	Nil
Long Point	18/05/2018 0:20	1.6	F	35	Yes	IA	Nil
South Bulga	17/05/2018 21:24	1.9	E	36	Yes	33	Nil
Wambo Road	17/05/2018 23:02	2.2	E	38	Yes	<30	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 – May 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	17/05/2018 21:00	1.5	E	47	Yes	42	Nil
Bulga Village	17/05/2018 23:23	2.2	E	48	Yes	34	Nil
Gouldsville	18/05/2018 0:47	1.5	F	45	Yes	IA	Nil
Inlet Rd	17/05/2018 21:23	1.6	F	47	Yes	32	Nil
Inlet Rd West	17/05/2018 21:00	1.5	E	45	Yes	NM	Nil
Long Point	18/05/2018 0:20	1.6	F	45	Yes	IA	Nil
South Bulga	17/05/2018 21:24	1.9	E	46	Yes	34	Nil
Wambo Road	17/05/2018 23:02	2.2	E	48	Yes	33	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 – May 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	17/05/2018 21:00	IA/36	NA/52	NA/16	NA/0	NA/Nil	NA
Bulga Village	17/05/2018 23:23	<30/<30	NA/NA	NA/NA	NA/NA	NA/NA	NA
Gouldsville	18/05/2018 0:47	29/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd	17/05/2018 21:23	32/<30	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd West	17/05/2018 21:00	28/NM	NA/NA	NA/NA	NA/NA	NA/NA	NA
Long Point	18/05/2018 0:20	<25/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
South Bulga	17/05/2018 21:24	IA/33	NA/49	NA/16	NA/0	NA/Nil	NA
Wambo Road	17/05/2018 23:02	<30/<30	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.

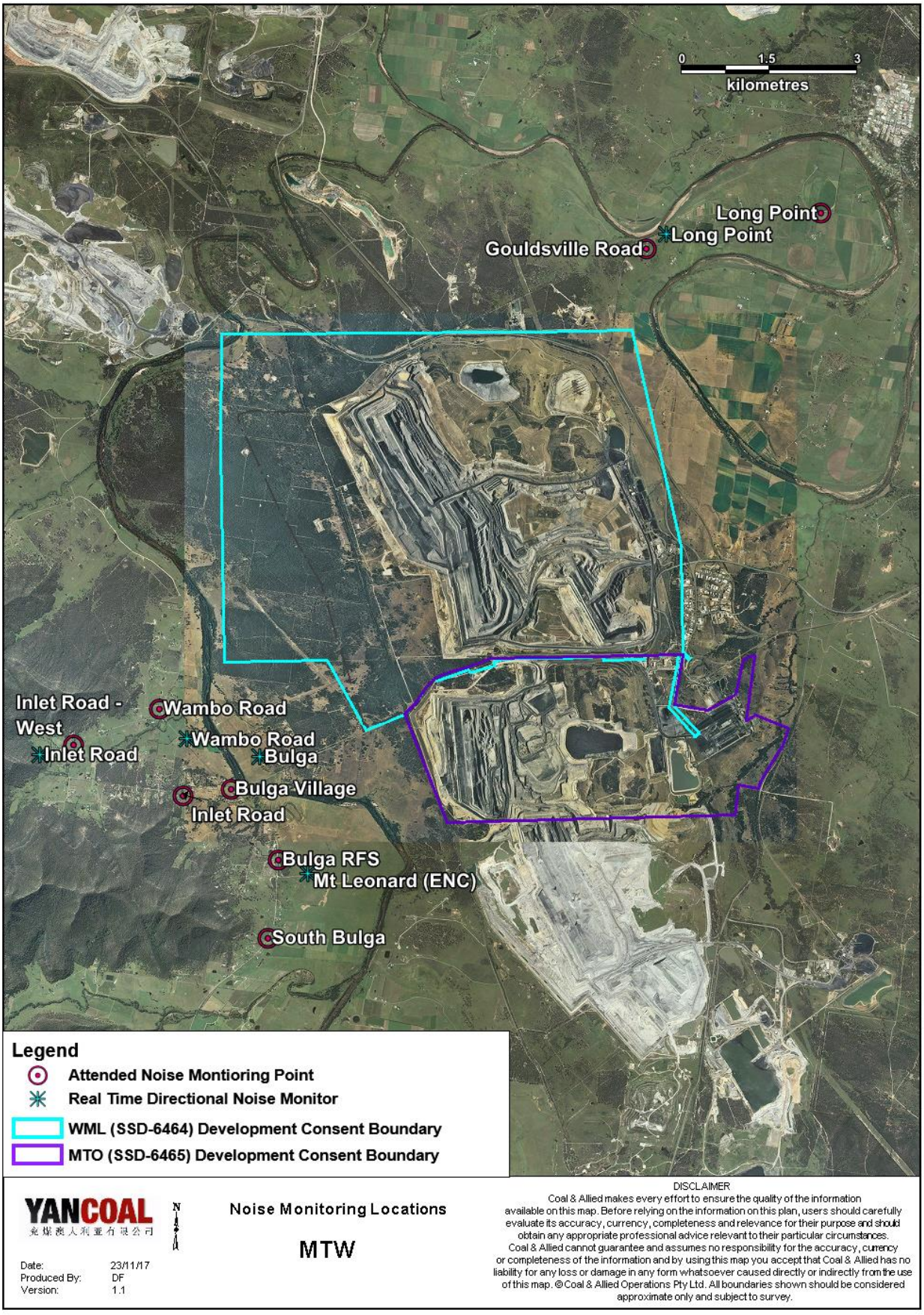

Figure 16: Noise Monitoring Location Plan

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 May are provided in **Table 8**.

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Table 8: Supplementary Attended Noise Monitoring Data – May 2018

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
483	3	2	0.6

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 1220 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**.

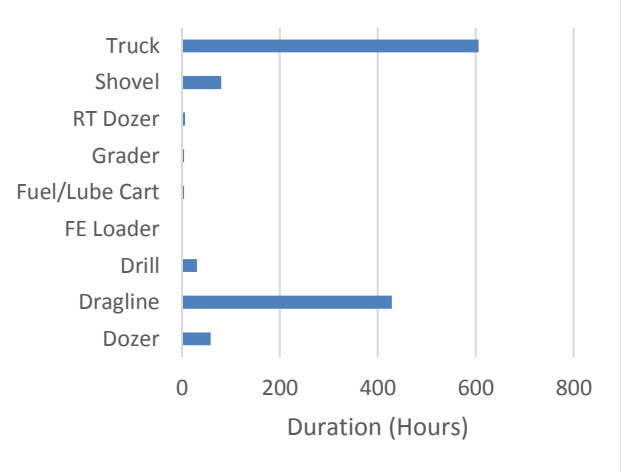

Figure 17: Operational Downtime by Equipment Type – May 2018

7.0 REHABILITATION

During May 2018, 20.4 Ha of land was released for rehabilitation, 9.6 Ha of land was bulk shaped, 2.2 Ha of land was topsoiled, 10.0 Ha of land was composted and 6.2 Ha of land was rehabilitated.

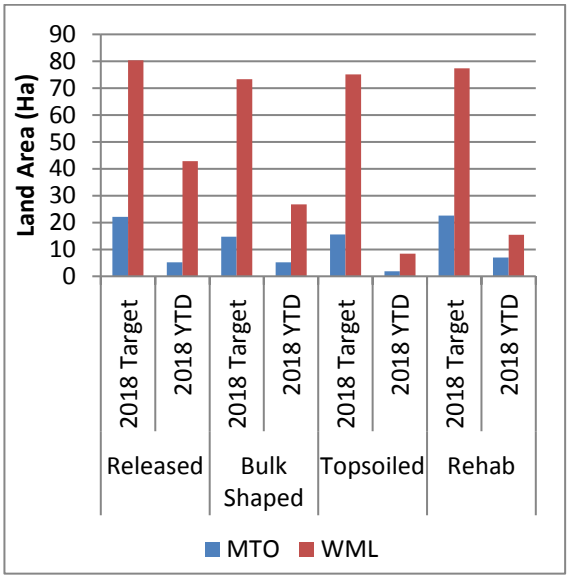

Figure 18: Rehabilitation YTD – May 2018

8.0 ENVIRONMENTAL INCIDENTS

During the reporting period there were no reportable environmental incidents.

9.0 COMPLAINTS

During the reporting period 25 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	14	0	1	30
February	8	5	2	3	1	19
March	21	0	0	2	0	23
April	8	3	9	3	2	25
May	10	11	3	1	0	25
June						
July						
August						
September						
October						
November						
December						
Total	56	25	28	9	4	122

Appendix A: Meteorological Data

Table 10: Meteorological Data – Charlton Ridge Meteorological Station – May 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)
1/05/2018	23	9	91	39	712	161	1.7	0.0
2/05/2018	24	10	93	44	830	182	1.6	0.0
3/05/2018	27	9	92	28	689	215	2.0	0.0
4/05/2018	28	13	72	23	767	261	3.7	0.0
5/05/2018	23	6	68	22	704	209	2.1	0.0
6/05/2018	22	5	83	25	702	159	2.2	0.0
7/05/2018	25	8	94	21	665	200	2.0	0.0
8/05/2018	25	8	84	31	739	184	1.6	0.0
9/05/2018	25	9	83	30	643	199	1.8	0.0
10/05/2018	25	10	71	21	799	293	4.1	0.0
11/05/2018	15	6	62	27	870	310	6.2	0.0
12/05/2018	19	8	86	36	978	273	5.3	0.6
13/05/2018	19	10	73	45	929	218	3.1	0.0
14/05/2018	18	9	72	41	554	179	3.4	0.0
15/05/2018	21	7	80	28	663	207	1.7	0.0
16/05/2018	20	8	86	38	772	160	2.4	0.0
17/05/2018	20	6	93	37	669	176	1.6	0.0
18/05/2018	22	4	84	17	640	224	2.0	0.0
19/05/2018	21	5	77	31	620	191	1.6	0.0
20/05/2018	20	4	78	28	655	283	3.2	0.0
21/05/2018	21	6	70	25	647	293	3.8	0.0
22/05/2018	22	7	72	32	629	289	3.3	0.0
23/05/2018	21	7	83	40	621	199	1.5	0.0
24/05/2018	22	6	91	35	598	189	1.6	0.0
25/05/2018	21	10	84	36	760	159	2.4	0.0
26/05/2018	21	8	90	44	595	160	2.0	0.0
27/05/2018	18	7	98	55	721	187	1.6	0.0
28/05/2018	20	7	93	44	784	179	1.6	0.0
29/05/2018	23	7	93	29	599	269	2.1	0.0
30/05/2018	18	8	96	28	704	231	3.0	8.4
31/05/2018	17	5	79	28	847	247	3.6	0.0

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