Monthly Environmental Monitoring Report

Yancoal Mt Thorley Warkworth

January 2018

CONTENTS

Figures

Tables

Revision History

Version No.	Person Responsible	Document Status	Date
1.0	**Environmental Advisor**	**Draft**	**02/03/2018**
1.1	**Environmental Specialist**	**Final**	**15/03/2018**

1.0 INTRODUCTION

This report has been compiled to provide a monthly summary of environmental monitoring results for Mt Thorley Warkworth (MTW). This report includes all monitoring data collected for the period 1st January to 31st January 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)
January	10.8	10.8

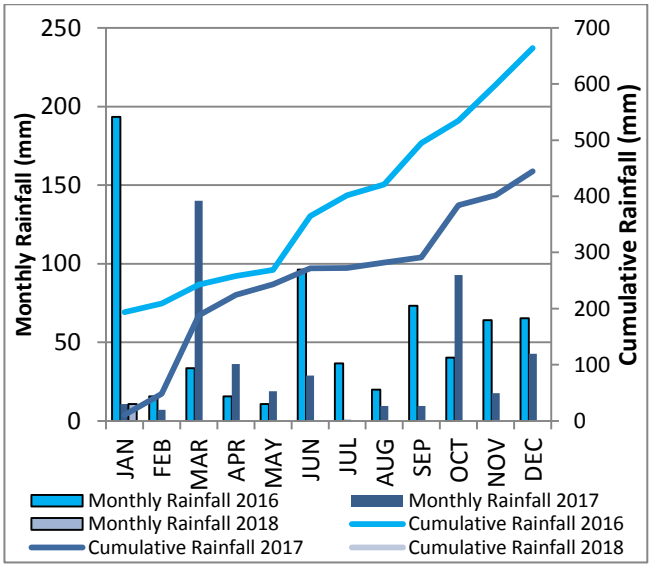

Figure 1: Rainfall Trend YTD

2.1.2 Wind Speed and Direction

Winds from the South – West were dominant throughout the reporting period as shown in Figure 2.

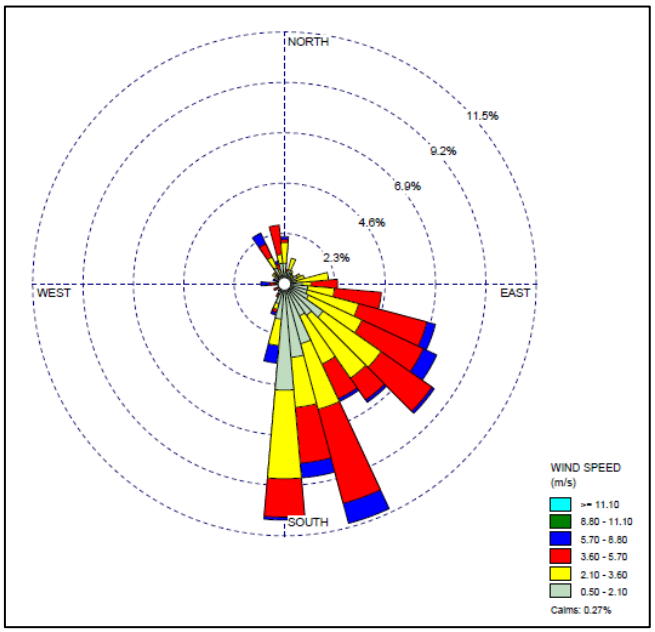

Figure 2: Charlton Ridge Wind Rose – January 2018

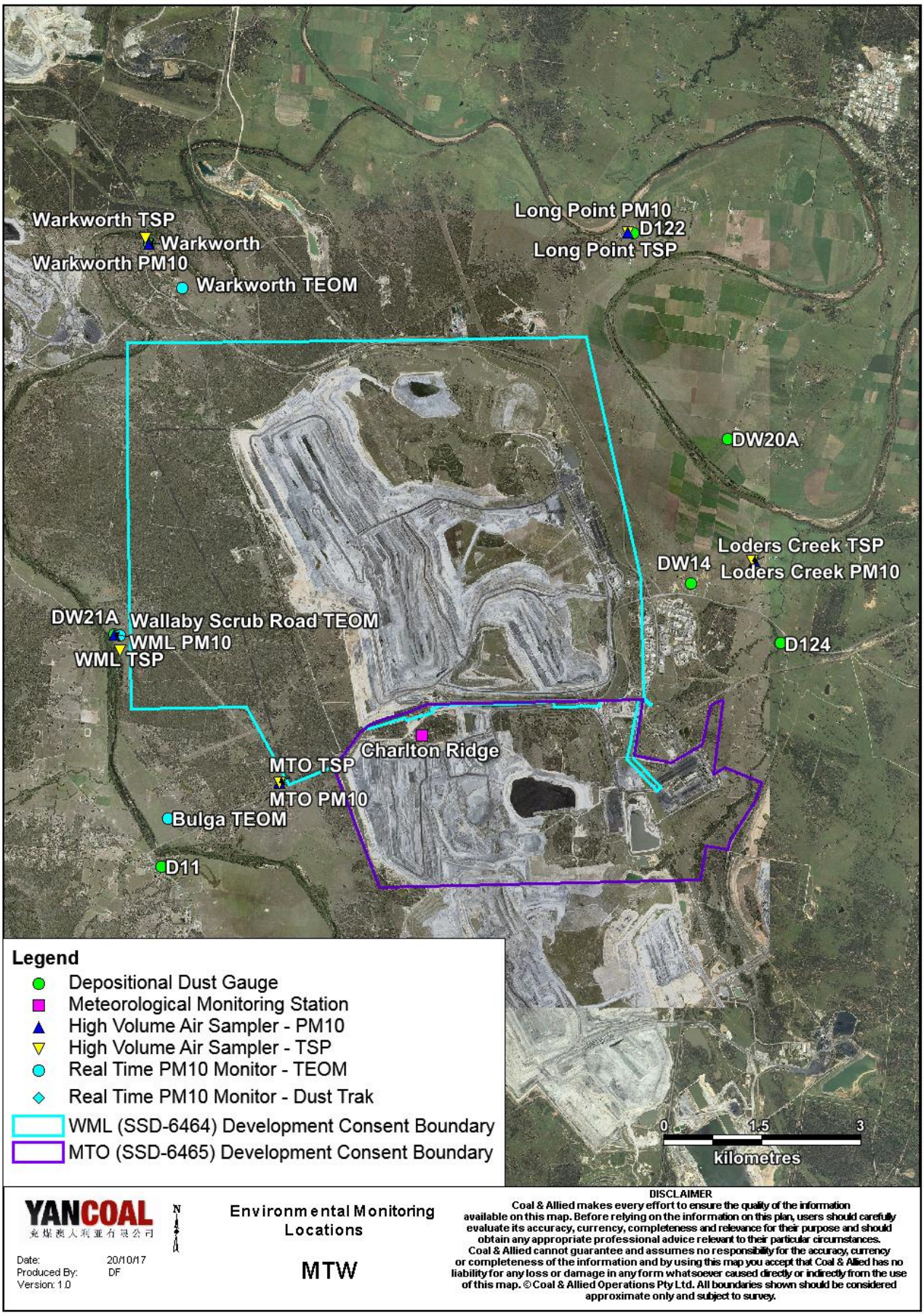

Figure 3: Air Quality Monitoring Locations

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 DW21A and Warkworth monitors recorded a monthly result above the long term impact assessment criteria of 4.0 g/m^2 per month. Field notes associated with DW21A 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.

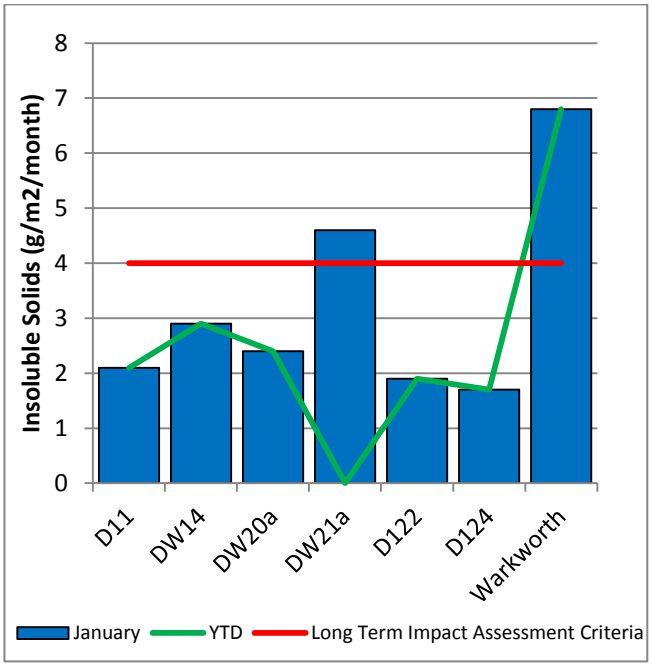

Figure 4: Depositional Dust – January 2018

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

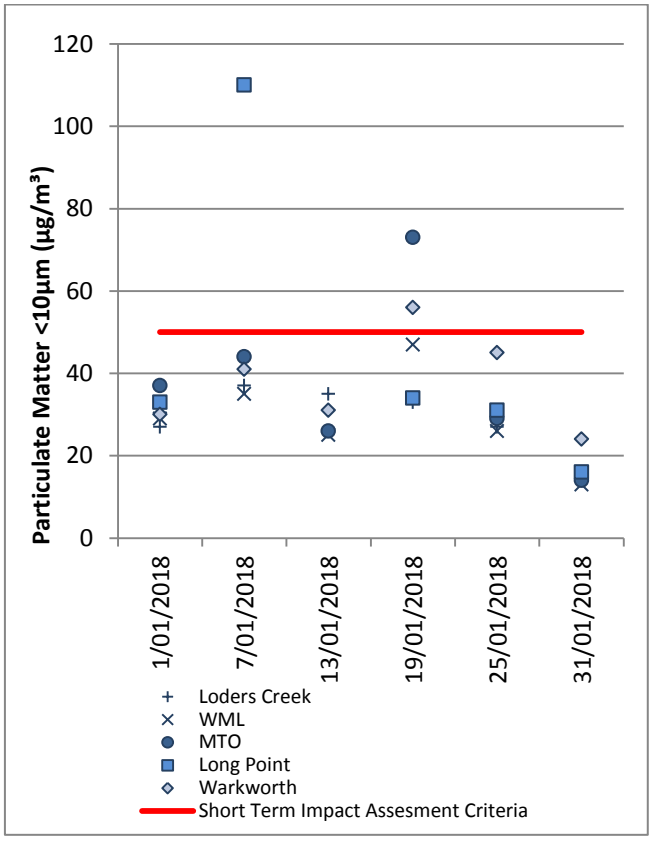

Figure 5 shows the individual PM_{10} results at each monitoring station against the short term impact assessment criteria of 50µg/m³.

Data was not available on 13/01/2018 at the Long Point HVAS due to HVAS motor fault.

On 7/01/2018 the Long Point HVAS PM_{10} unit recorded results which were greater than the short term (24hr) PM_{10} impact assessment criteria of 50µg/m^3. Investigation determined that MTW's maximum contribution at the Long Point monitor was <19.5 µg/m^3.

Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 19/01/2018, two HVAS PM_{10} units recorded results which were greater than the short term (24hr) PM_{10} impact assessment criteria; MTO (73 µg/m^3) and Warkworth (56µg/m^3).

Investigation determined that HVO's maximum contribution at each monitor is as follows:

- MTO – 42.7 µg/m^3; or 58% of the measured result.
- Warkworth – 23ug/m3 or 41% of the measured result.

Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

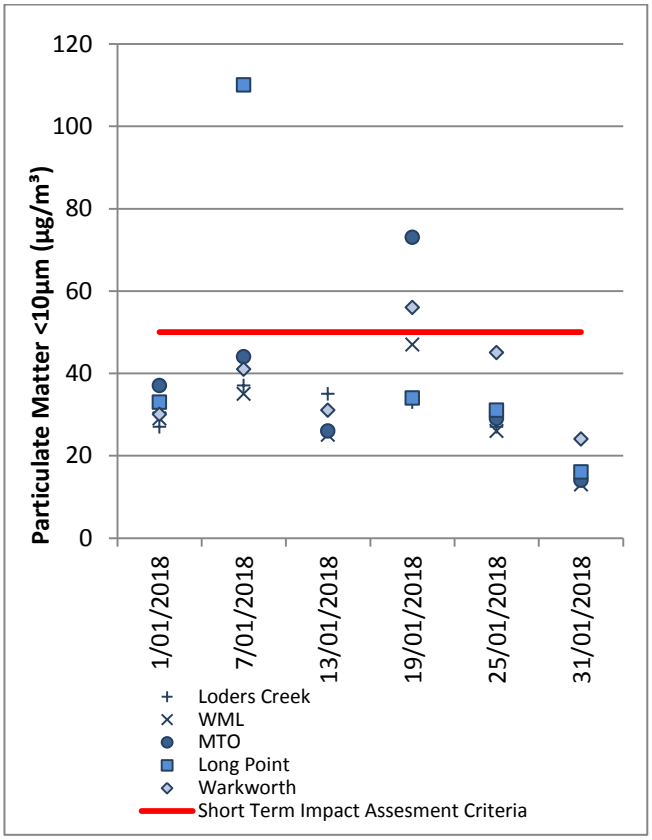

Figure 5: Individual PM_{10} Results – January 2018

Figure 6 shows the annual average PM_{10} results against the long term impact assessment criteria.

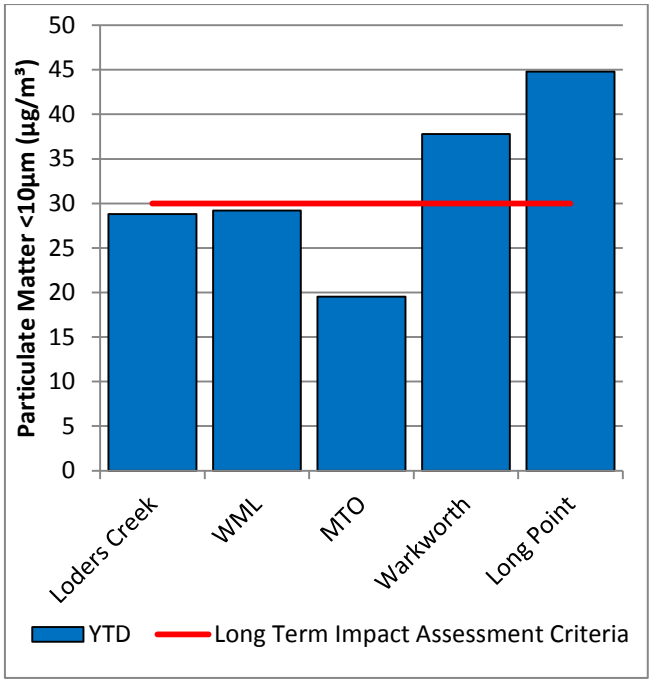

Figure 6: Annual Average PM_{10} – January 2018

2.3.2 TSP Results

Figure 7 shows the annual average TSP results compared against the long term impact assessment criteria of 90µg/m³.

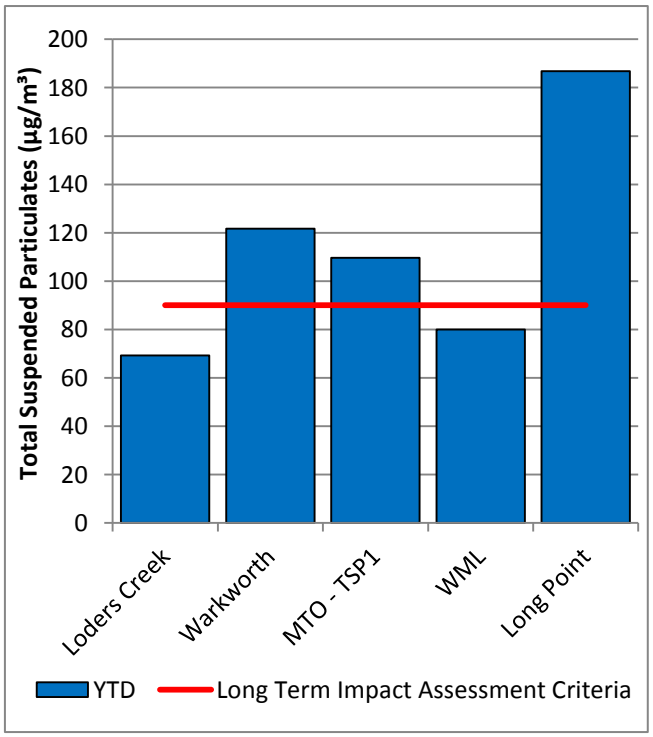

Figure 7: Annual Average Total Suspended Particulates – January 2018

2.3.3 Real Time PM_{10} Results

Mt Thorley Warkworth 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 (62.4 µg/m³) which exceeded the short term (24hr) criteria on 9th January 2018. This measurement was assessed for MTW's maximum potential contribution based on mining activities and meteorological conditions on this day resulting in a maximum estimated contribution of <8 µg/m³ from the direction of MTW.

Two results recorded elevated levels at the Warkworth TEOM which exceeded the short term (24hr) criteria. These measurements were assessed for MTW's maximum potential contribution based on mining activities and meteorological conditions on these days.

Resulting in the following maximum estimated contributions from the direction of MTW:

- 19 January 2018 – 27.6 µg/m³; and
- 24 January 2018 – 28.4 µg/m³.

2.3.4 Real Time Alarms for Air Quality

During January, the real time monitoring system generated 188 automated air quality related alerts, including 48 alert for adverse meteorological conditions and 140 alerts for elevated PM_{10} levels.

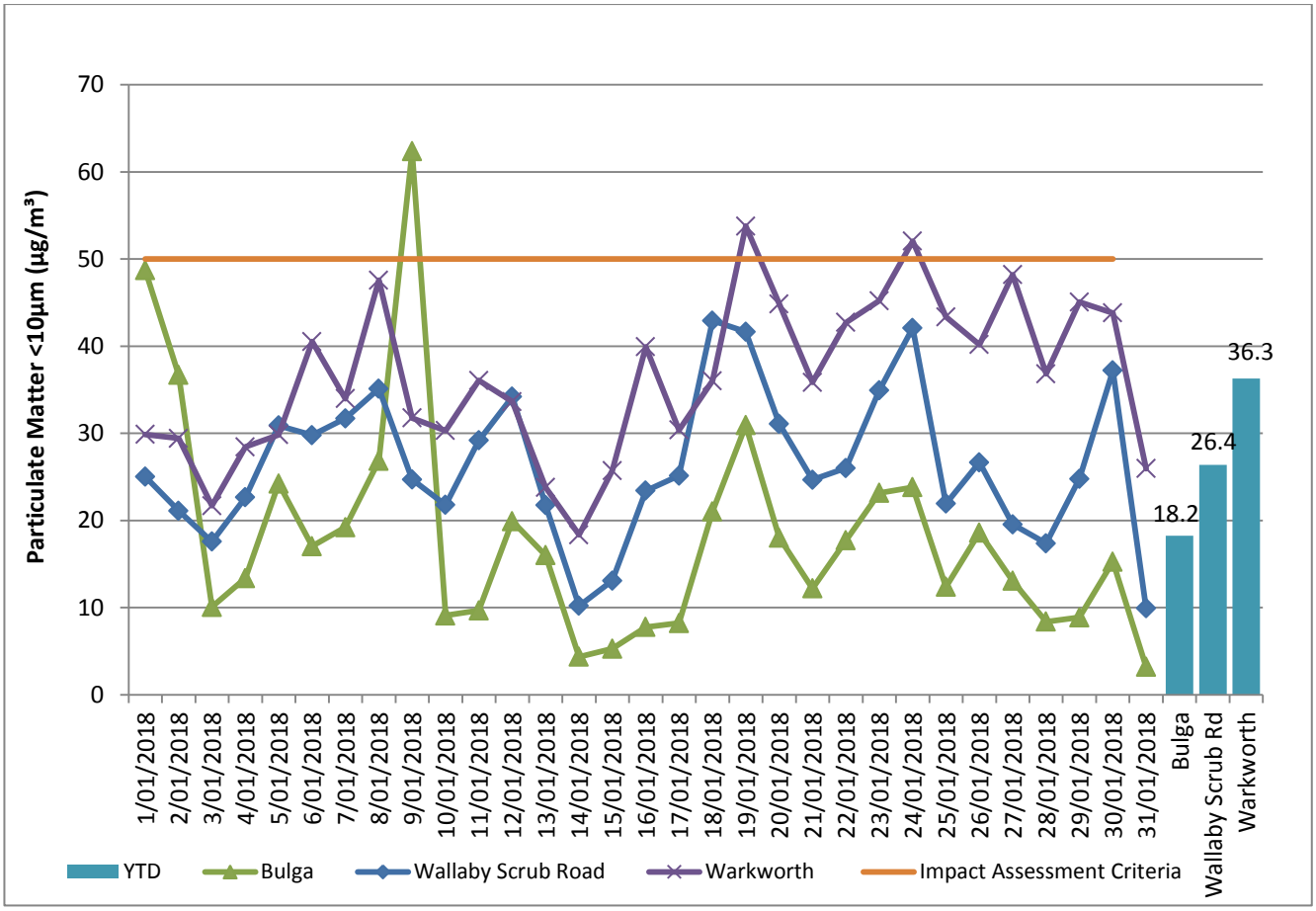

Figure 8: Real Time PM_{10} daily 24hr average and annual average – January 2018

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 March 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 March 2018 report.

3.3 HRSTS Discharge

MTW participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points 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 **Error! eference source not found.**.

4.1 Blast Monitoring Results

During January 2018, 24 blasts were initiated at MTW. Figure 9 to Figure 12 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.

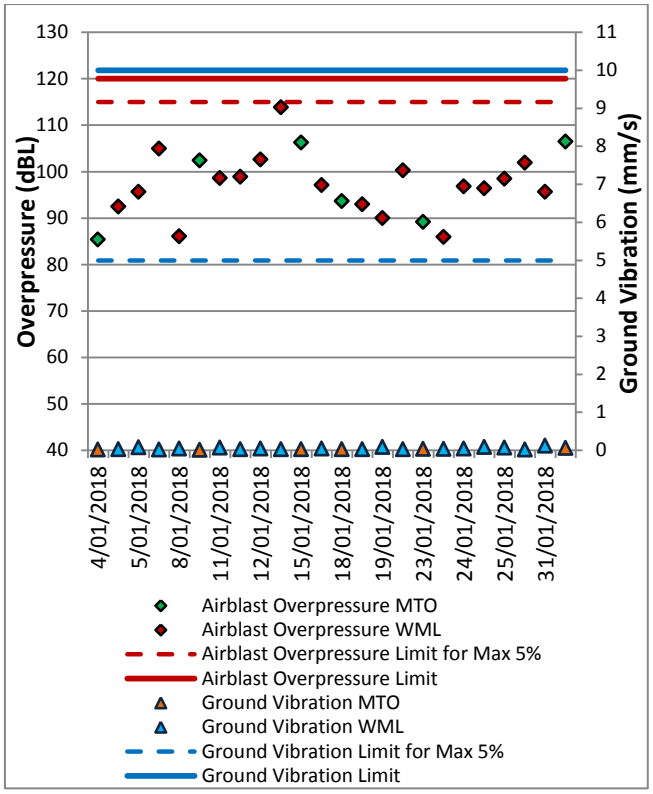

Figure 9: Abbey Green Blast Monitoring Results – January 2018

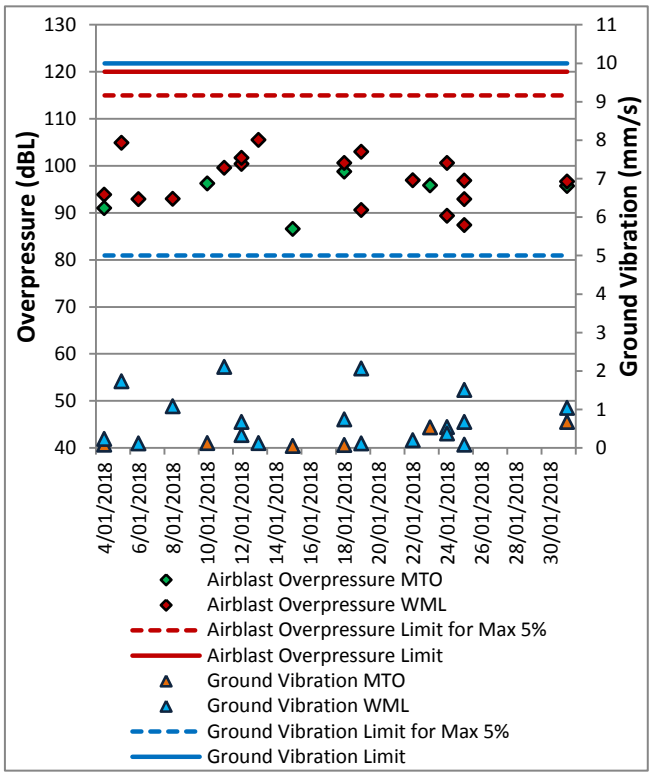

Figure 10: Bulga Village Blast Monitoring Results – January 2018

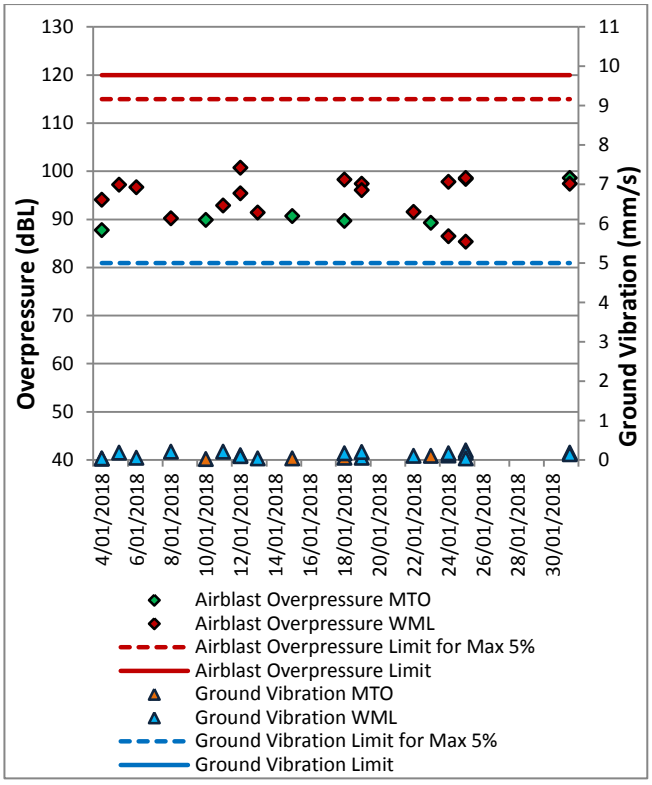

Figure 11: MTIE Blast Monitoring Results – January 2018

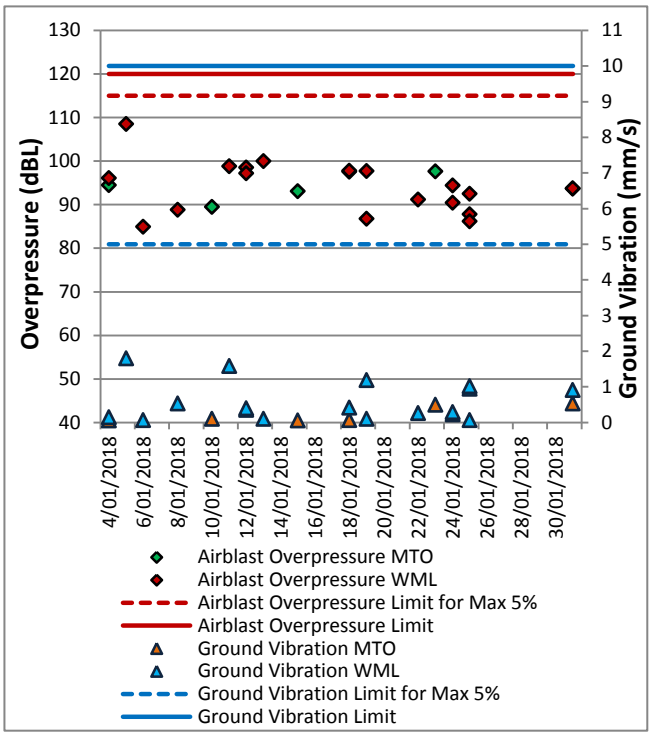

Figure 12: Wollemi Peak Road Blast Monitoring Results – January 2018

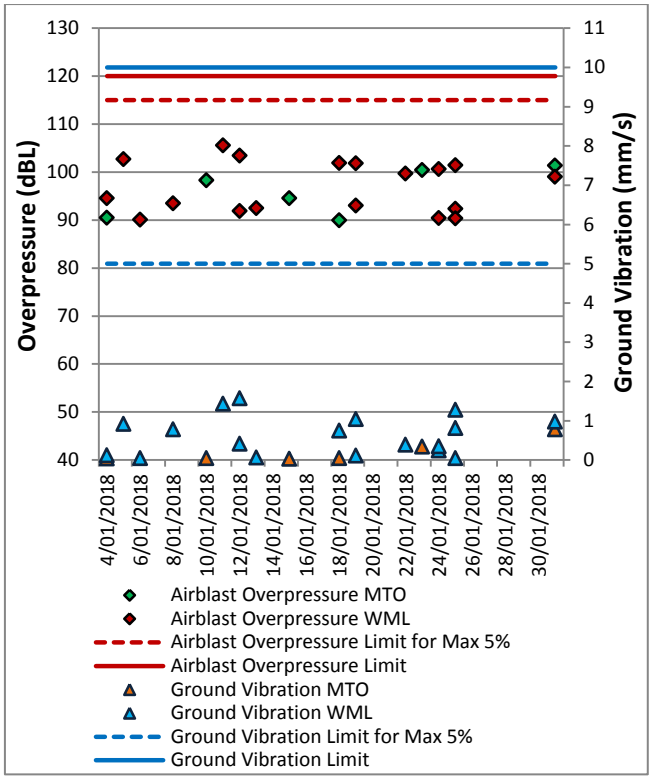

Figure 13: Wambo Road Blast Monitoring Results – January 2018

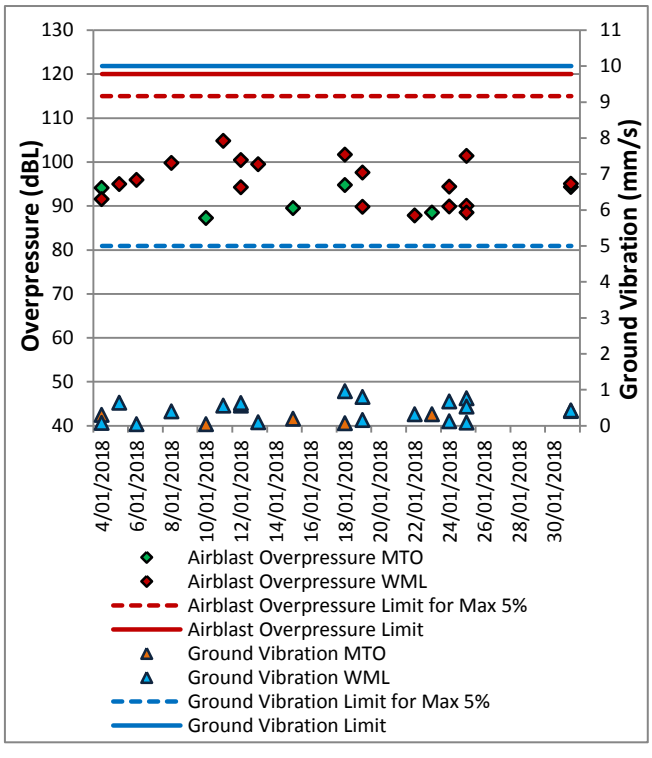

Figure 14: Warkworth Blast Monitoring Results – January 2018

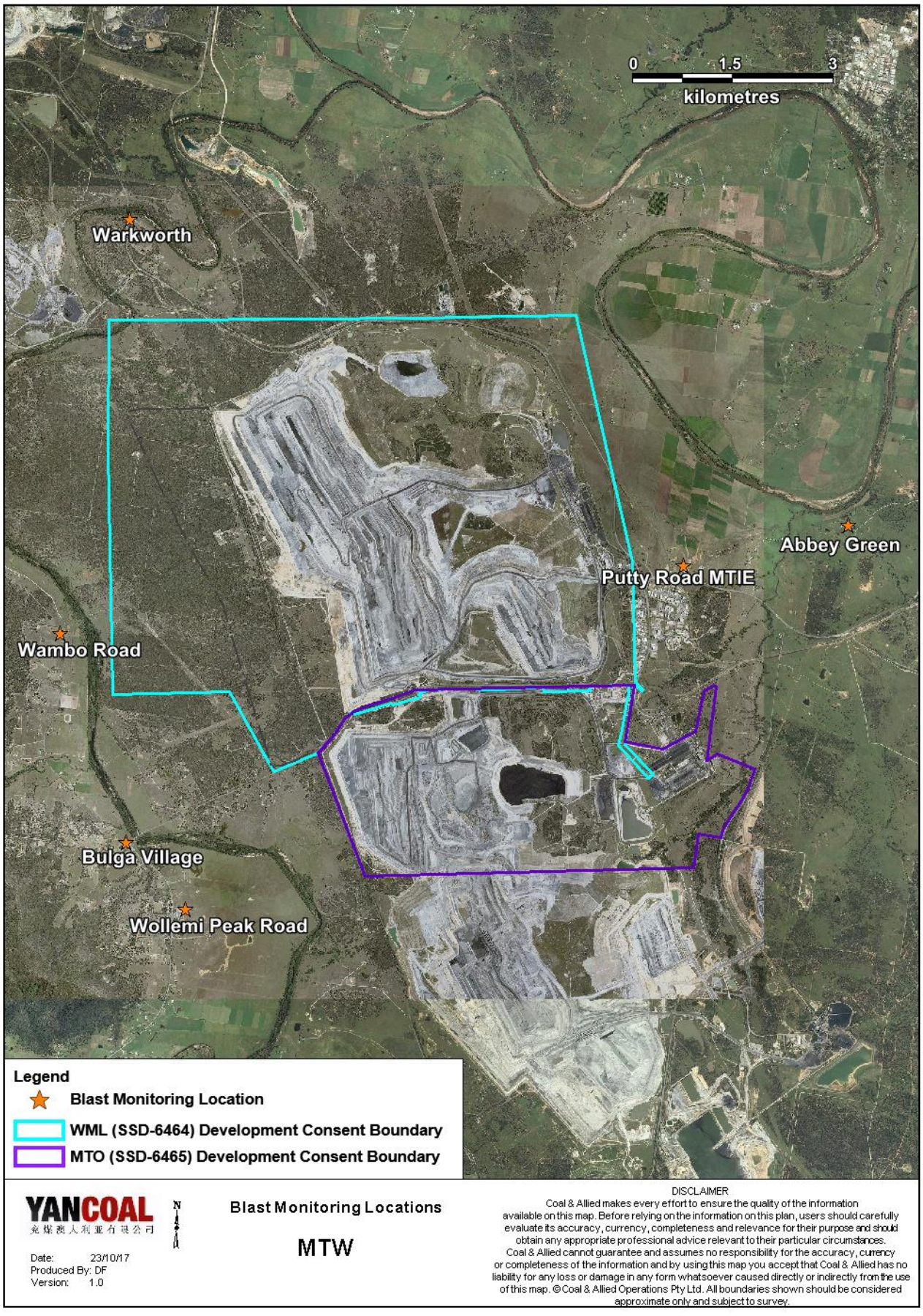

Figure 15: MTW Blast Monitoring Location Plan

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. 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 16 January 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 – January 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	16/01/2018 23:12	4.1	D	37	No	IA	NA
Bulga Village	16/01/2018 23:12	4.2	D	38	No	IA	NA
Gouldsville	16/01/2018 23:12	3.9	D	38	No	IA	NA
Inlet Rd	16/01/2018 23:12	3.9	D	37	No	<25	NA
Inlet Rd West	16/01/2018 23:12	4.4	D	35	No	IA	NA
Long Point	16/01/2018 23:12	4.4	D	35	No	IA	NA
South Bulga	16/01/2018 23:12	2.8	D	35	Yes	IA	Nil
Wambo Road	16/01/2018 23:12	4.0	D	38	No	<25	NA

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.
6. Revised LAeq, 15minute level following application of low frequency noise penalty as per the INP where applicable.

Table 4: $L_{A1,\ 1\ minute}$ Warkworth - Impact Assessment Criteria – January 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	16/01/2018 23:12	4.1	D	47	No	IA	NA
Bulga Village	16/01/2018 23:12	4.2	D	48	No	IA	NA
Gouldsville	16/01/2018 23:12	3.9	D	48	No	IA	NA
Inlet Rd	16/01/2018 23:12	3.9	D	47	No	<30	NA
Inlet Rd West	16/01/2018 23:12	4.4	D	45	No	IA	NA
Long Point	16/01/2018 23:12	4.4	D	45	No	IA	NA
South Bulga	16/01/2018 23:12	2.8	D	45	Yes	IA	Nil
Wambo Road	16/01/2018 23:12	4.0	D	48	No	<25	NA

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 – January 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	16/01/2018 23:12	4.1	D	37	No	IA	NA
Bulga Village	16/01/2018 23:12	4.2	D	38	No	IA	NA
Gouldsville	16/01/2018 23:12	3.9	D	35	No	<30	NA
Inlet Rd	16/01/2018 23:12	3.9	D	37	No	IA	NA
Inlet Rd West	16/01/2018 23:12	4.4	D	35	No	IA	NA
Long Point	16/01/2018 23:12	4.4	D	35	No	IA	NA
South Bulga	16/01/2018 23:12	2.8	D	36	Yes	IA	Nil
Wambo Road	16/01/2018 23:12	4.0	D	38	No	IA	NA

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.
6. Revised LAeq, 15minute level following application of low frequency noise penalty as per the INP where applicable.

Table 6: $L_{A1,\ 1Minute}$ Mount Thorley - Impact Assessment Criteria – January 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	16/01/2018 23:12	4.1	D	47	No	IA	NA
Bulga Village	16/01/2018 23:12	4.2	D	48	No	IA	NA
Gouldsville	16/01/2018 23:12	3.9	D	45	No	<30	NA
Inlet Rd	16/01/2018 23:12	3.9	D	47	No	IA	NA
Inlet Rd West	16/01/2018 23:12	4.4	D	45	No	IA	NA
Long Point	16/01/2018 23:12	4.4	D	45	No	IA	NA
South Bulga	16/01/2018 23:12	2.8	D	46	Yes	IA	Nil
Wambo Road	16/01/2018 23:12	4.0	D	48	No	IA	NA

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. During January 2018 no measurements 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 – January 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	16/01/2018 23:12	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Bulga Village	16/01/2018 23:12	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Gouldsville	16/01/2018 23:12	IA/<30	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd	16/01/2018 23:12	<25/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Inlet Rd West	16/01/2018 23:12	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Long Point	16/01/2018 23:12	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
South Bulga	16/01/2018 23:12	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA	NA
Wambo Road	16/01/2018 23:12	<25/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.

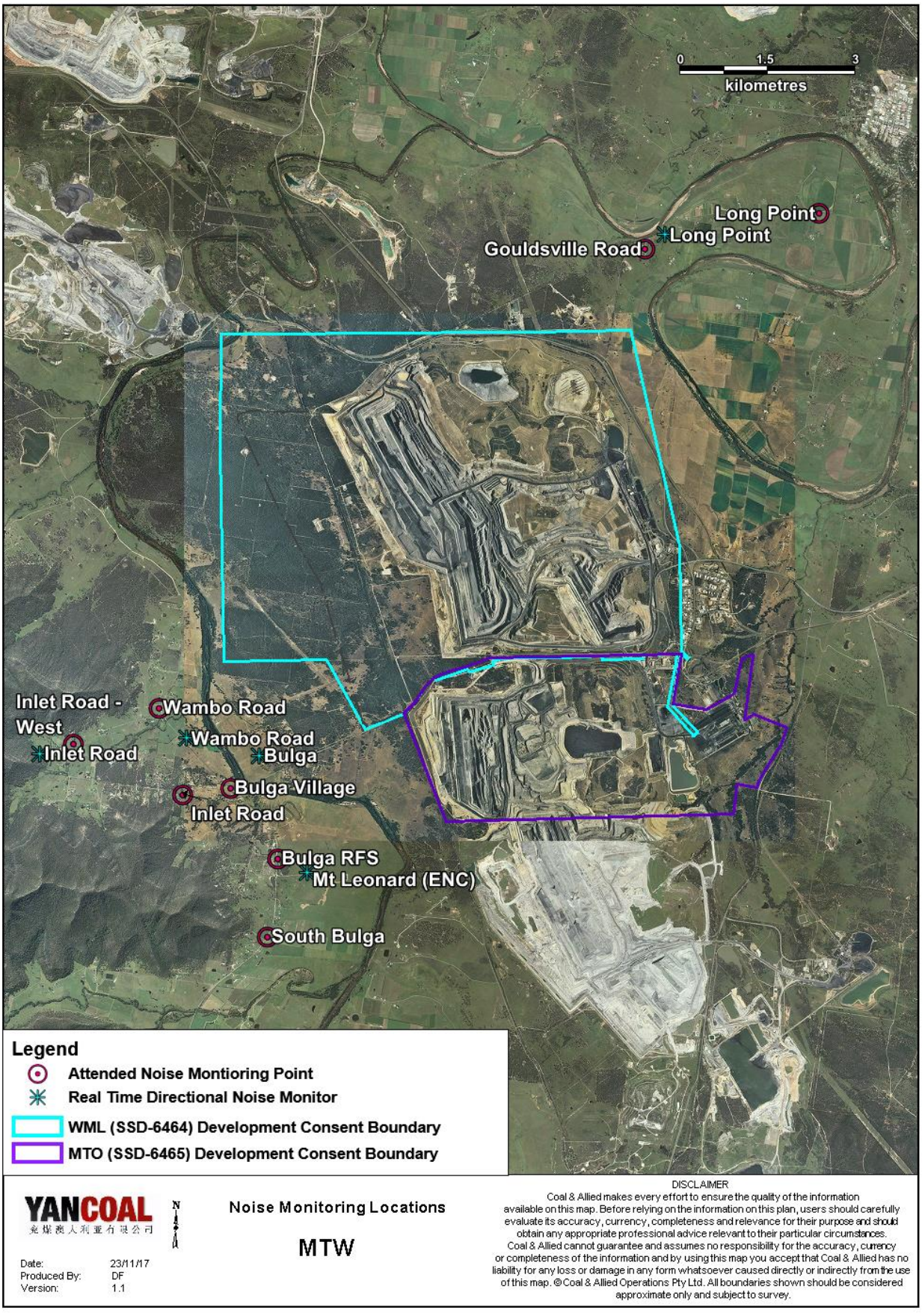

Figure 16: Noise Monitoring Location Plan

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 January are provided in Table 8.

Table 8: Supplementary Attended Noise Monitoring Data – January 2018

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
539	3	3	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 January, a total of 2531 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.

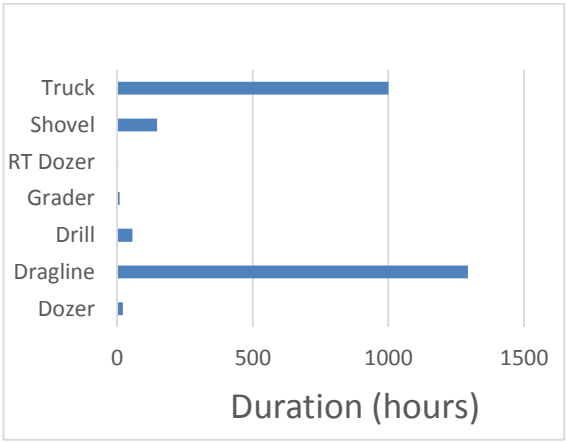

Figure 17: Operational Downtime by Equipment Type – January 2018

7.0 REHABILITATION

During January, 1.3 Ha of land was released, 1.8 Ha of land was bulk shaped and 9.3 Ha of land was rehabilitated.

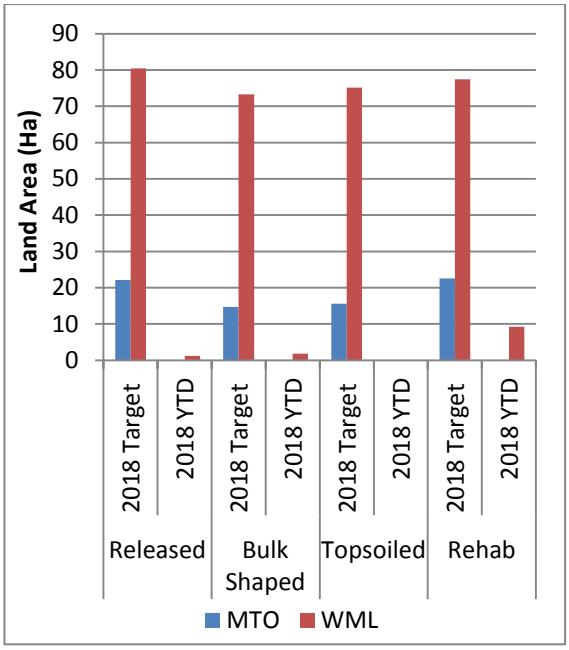

Figure 18: Rehabilitation YTD – January 2018

8.0 ENVIRONMENTAL INCIDENTS

During the reporting period there were no reportable environmental incidents.

9.0 COMPLAINTS

During the reporting period 30 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	1	1	31
February	-	-	-	-	-	-
March	-	-	-	-	-	-
April	-	-	-	-	-	-
May	-	-	-	-	-	-
June	-	-	-	-	-	-
July	-	-	-	-	-	-
August	-	-	-	-	-	-
September	-	-	-	-	-	-
October	-	-	-	-	-	-
November	-	-	-	-	-	-
December	-	-	-	-	-	-
Total	9	6	14	1	1	31

Appendix A: Meteorological Data

Table 10: Meteorological Data – Charlton Ridge Meteorological Station – January 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)
1/01/2018	35	19	84	21	1278	152	2.9	0.0
2/01/2018	32	19	84	35	1301	137	3.0	0.0
3/01/2018	28	18	88	41	1435	145	3.8	0.0
4/01/2018	29	17	75	33	1602	136	2.5	0.0
5/01/2018	35	14	84	16	1214	147	2.3	0.0
6/01/2018	41	18	74	10	1105	177	2.7	0.0
7/01/2018	44	22	58	9	1103	235	3.7	0.0
8/01/2018	42	21	83	13	1126	161	2.5	10.2
9/01/2018	34	21	82	33	1356	159	3.2	0.2
10/01/2018	24	18	87	61	924	132	3.0	0.2
11/01/2018	28	18	80	48	1556	135	2.2	0.0
12/01/2018	38	19	87	24	1258	137	1.8	0.0
13/01/2018	37	20	80	24	1455	253	4.5	0.0
14/01/2018	26	16	85	20	1535	177	5.1	0.0
15/01/2018	28	13	64	19	1454	166	3.9	0.0
16/01/2018	27	16	60	25	1492	153	4.6	0.0
17/01/2018	30	13	72	16	1146	169	2.4	0.0
18/01/2018	35	11	78	5	1139	154	2.1	0.0
19/01/2018	39	13	68	7	1115	156	2.5	0.0
20/01/2018	39	13	76	1	1143	148	2.9	0.0
21/01/2018	38	16	81	14	1187	144	2.6	0.0
22/01/2018	41	27	29	7	777	123	3.5	0.0
23/01/2018	39	20	69	9	1285	151	2.2	0.0
24/01/2018	39	23	66	11	1287	129	2.8	0.0
25/01/2018	36	20	82	25	1431	158	2.5	0.0
26/01/2018	36	21	84	29	1344	157	2.4	0.2
27/01/2018	37	21	87	22	1187	154	2.7	0.0
28/01/2018	35	21	80	29	1403	130	3.8	0.0
29/01/2018	34	19	88	30	1323	124	3.5	0.0
30/01/2018	36	17	85	14	1084	148	2.4	0.0
31/01/2018	26	17	81	57	253	162	4.5	0.0

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