

Minutes of the 55th Meeting of the Tarrawonga Coal Mine Community Consultative Committee (TCCC)

Meeting Held	13 th February 2019 between 10:00AM- 1:00PM		
Venue	Tarrawonga Coal Mine (TCM), training room		
Agenda Item	Discussion and Description	Action and Accountability	Status/ Date

1. Present and Apologies	<p><u>Present:</u> Mr David Ross (DR)- Independent Chairman, Mr David Moses (DM), Gunnedah Shire council Representative, Mrs Cath Collyer (CC)- Community Representative, Mr John Hamson (JHa), Operations Manager- TCM, Mr Sebastien Moreno (SM)- Environmental Superintendent- TCM, Mr Daryl Campbell (DC), Community Relations Officer- WHC Mr James Tomlin (JT), AGE consultant</p>		
	<p><u>Apologies:</u> Mrs Colleen Fuller (CF)- Community Representative Mr Andrew Johns (AJ), Gunnedah Shire Council Representative Mr Cameron Staines (CS), Narrabri Shire council Representative, Mr Tim Muldoon (TM)- Group Manager Community Relations and Pty Mrs Julie Heiler (JH)- Community Representative, Mrs Rebecca Ryan (RR)- Community Representative,</p>		

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2. Declaration of Pecuniary or Non-Pecuniary Interests	DR- declared that he is paid a fee for participation as Independent Chairman		
3. Previous Minutes Actions	DR- Blair Meyer (BM) has been transferred to MCCM and David Moses has replaced Ann Luke (AL).	DR- to write a thank you letter for BM and AL for their support to CCC meeting	DR- to prepare letter.
	CC- Queried about GW inflows. SM- provided a summary Table at previous CCC meeting with GW and SW modelled data provided by water experts.		Complete. SM- sent a copy of the GW summary table to CC.
	CCC members - requested to have a presentation of GW similar to the other BTM mines.	SM – to invite Hydrogeologist- (water consultant) at next CCC Meeting to make a presentation on GW.	Complete. JT from AGE was invited to make a presentation on GW.
	CC- requested WHC list of trade and apprenticeship.	TM/SM- to follow up with HR and provide a copy of list.	Complete. SM- provided hard copy of information available on the WHC website.

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	CCC members- asked for local procurement strategy to be presented.	JH – asked for a breakdown of financial support per Shires to present at next meeting.	Complete. JHa- gave a printed copy of the breakdown financial support to CC.
	JHA- wants to discuss fire emergency with RFS members.	SM – to send invitation to RFS to come to site.	JHa- was contacted by Richard and told him that TCM can supply water at the gate if requested by RFS. SM- to send an invitation to RFS to come to site
	JH- Concern about potential damage of fire truck water pumps if residue of Dust suppressant is still in the water supplied by the mine.	JHa- to check with company “Dust a Side” potential risk and compatibility for fire pumps and equipment.	Complete JHa- ratio of suppressant is low and product is highly diluted so should not impact on pumps.
	JH- asked about ratio employees versus Contractors travelling on the haulage road. RR- requested a figure around employee’s retention rate. CC- overall, community gives a good reputation to TCM and acknowledge it is a great place to work.	JHa- to follow up with Human Resources (HR) to find out the ratio employees versus contractors at TCM.	Complete. JHa- said approximately workforce is made of 75% WHC and 25% contractors. High retention with WHC but low within the contractors. WHC employees generally like the roster at TCM

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4. Business Arising	CC- Dust A side description and usage	DR- to look at feasibility (agreement with BTM mines) for the company “Dust A Side” to talk about dust suppressant.	
		DR- to provide CCC members with link to EPA Namoi Region website. DR- to discuss potential attendance of EPA at next BTM CCC meeting to explain air matters.	
	SM- TCM working toward a new MOP and a MOD of the Project Approval.	CC- requested SM to explain details of MOD and confirm date of submission.	
5. Mine Progress Report	JHa: - WHC bought new machines, - Change of roster temporary (day shift Saturday/Sunday) to ramp up to 3Mt, - Actual production behind schedule temporary - New excavator assembled next week, - Digital radio system 80% complete, - On-going usage of “Dust A Side” product.		

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6. Environmental Monitoring report	<p>SM- Read and explained the Quarterly Environmental Report results.</p> <p>JT- Made a presentation on GW and responded to all questions from the CCC Members.</p> <p>CCC Members- Thankful and appreciated efforts made by TCM to organise the visit of the GW expert.</p>	SM- to send presentation to CCC members via DR.	Complete, SM sent presentations to DR.
7. General business	<p>CC (rep CF)- what will be the measure taken by TCM and WHC if the water is depleted? What contingency plan is in place?</p> <p>JHa- Several scenarios are possible, but options will be unveiled once the mine gets closer to deplete all the stored water. Priority will be given to WHC employees and some of the measures can include reduction of shift and sending employees to other part of the business.</p> <p>CCC Members- requested to organise a site tour next year.</p>	<p>JHa- to provide an action/measure plan to the CCC members for the case of complete water depletion.</p> <p>JHa- Organise site tour at next CCC meeting</p>	

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8.Complaints	SM- No Complaint received since last CCC meeting.		
9. Next Meeting and Other Comments	DR- next TCCC meetings will be held on 15th May 2019.		
	DR-next BTM CCC meetings will be held on 16th May 2019		

Tarrawonga Coal Mine Community Consultative Committee Meeting #55

Quarterly Environmental Monitoring Report
1 November 2018 – 31 January 2019



Photo taken from Northern Rehabilitation area (29/05/19)

This report has been prepared for the Community Consultative Committee (CCC) Meeting to show Environmental monitoring performance at Tarrawonga Coal Mine (TCM) for the reporting period from November 1st to January 31st 2018. Maps with all the monitoring locations are available in *Appendix A*.

Noise Monitoring

Road Noise Monitoring was conducted at Brooklyn 1, Brooklyn 2 and Werona properties in December 2018. The noise criterion was not exceeded for all the sites.

Attended noise monitoring was conducted at the “Bungalow” (TN4), “Barbers Lagoon” (TN3) and “Matong” (TN2) properties from 10th to 13th December 2018. The noise criterion for the mine is 35dB(A) Leq (15 min) for all operating times.

The results below and in *Appendix B* show that noise emissions from the mine did not exceed the operational noise criterion at the “Barbers Lagoon”, “Bungalow” or “Matong” monitoring locations during the monitoring event.

Noise from the mine must not exceed 45 dB(A) L1 (1 min) between 10 pm and 7 am. This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The results of the sleep disturbance monitoring show that the measured L1 (1 min) noise level did not exceed the sleep disturbance criterion.

The real time noise monitor located on the “Coomalgah” property remains a management tool so the noise criteria are not applicable at that site. Level of noise recorded at that location is managed according to the noise management plan and trigger action response plan.

Table- 1.a: Road Noise Monitoring results for December 2018 (extracted from SLR reports)

Location	Measured Coal Haulage LAeq(1hour) Contribution dBA		Noise Criteria LAeq(1hour) dBA	Compliance
	Day	Evening	Day& Evening	
Brooklyn 1	58	1	60	Y
Brooklyn 2	45	1	60	Y
Werona	1	44	60	Y

Note 1: Noise monitoring was not conducted during this period at this location.

Table- 1.b: Attended Noise Monitoring results for Quarter 4 2018 (extracted from SLR reports)

EPL ID	Location	Date	Tarrawonga Coal Mine Contribution dBA				Criteria	Measurement Periods	Weather Compliant			Compliant
			LAeq(15minute) Day	LAeq(15minute) Evening	LAeq(15minute) Night	LA1(1minute) Night			Day	Eve	Night	
79a	Barbers Lagoon	10/12/2018	I/A	I/A	I/A	I/A	Day, Evening and Night – 35 dBA LAeq(15minute)	Day - 1.5 hrs Evening - 0.5 hrs Night – 1hrs	Yes	No	Yes	Yes
		11/12/2018	31	I/A	34	44			Yes	No	Yes	Yes
		12/12/2018	I/A	28	26	35			Yes	Yes	No	Yes
		13/12/2018	30	N/M	I/A	I/A			Yes	Yes	Yes	Yes
89	Bungalow	10/12/2018	28	I/A	I/A	I/A	Night – 45 dBA LA1(1minute) Cumulative Day, Evening, Night 40 dBA LAeq(15minute)	Day - 1.5 hrs Evening - 0.5 hrs Night – 1hrs	No	Yes	No	Yes
		11/12/2018	I/A	I/A	28	42			No	No	No	Yes
		12/12/2018	I/A	25	25	32			Yes	Yes	Yes	Yes
		13/12/2018	I/A	I/A	30	38			No	No	Yes	Yes
60a	Coomalgah/ Matong	10/12/2018	32	I/A	I/A	I/A	Cumulative Day, Evening, Night 40 dBA LAeq(15minute)	Day - 1.5 hrs Evening - 0.5 hrs Night – 1hrs	Yes	Yes	No	Yes
		11/12/2018	I/A	I/A	30	43			No	Yes	No	Yes
		12/12/2018	27	I/A	I/A	I/A			Yes	Yes	Yes	Yes
		13/12/2018	26	I/A	32	I/A			No	Yes	Yes	Yes

Note:
I/A = Inaudible
N/M = Not Measurable

Blast Monitoring

Blasting Results

Since 2006, there have been 860 blasts (until 31/01/2019) at TCM.

There has been no exceedance of blast criteria since the last meeting. The highest result obtained for blasting overpressure was **112.7 dB** recorded on 01/02/19 and the highest result for ground vibration was **0.74 mm/s** recorded at the Coomalgah station on 31/12/18.

Table- 2: Max Peak Overpressure and Ground Pressure for the Quarter

Monitor Location	Date	Max. Peak Overpressure (dB)	Criterion (dB)	Date	Max. Peak Ground Pressure (mm/s)	Criterion (mm/s)
Tarrowonga*	4/01/19	110.9	N/A	12/11/18	0.72	N/A
Coomalgah	01/02/19	112.7	115	31/12/18	0.74	10

**Not applicable according to EPL and PA11_0047 because project related property*

Air Quality Monitoring

Dust Deposition Results

Table 3 shows deposited dust gauge results over 12 months. All the monitors are located on project related land; as such compliance criteria (**4g/m²/month**) do not apply. The weather conditions have been relatively dry, overall deposited dust trends are steady during the reporting period (refer graph in *Appendix C*). Note the elevated level recorded at EB14 (East side) in December 2018 returned to normal (or average level) in January 2018. ALS was responsible for sampling and analysis and conducted an investigation to determine potential reason behind that elevated result. They found that the samples was contaminated.

Table 3 – Deposited Dust Gauge Results [g/m²/month]

MONTH	TEMPLEMORE (EB-4)	BOLLOL CREEK STN (EB-5)	AMBARDO (EB-6)	TARRAWONGA (EB-7)	THUJIN (EB-8)	PINE GROVE (EB-9)	TARRAWONGA MINE (EB-10)	TARRAWONGA MINE (EB-11)	TARRAWONGA MINE (EB-14)	TARRAWONGA MINE (EB-15)	JERALONG NORTH (EB-16)
Jan-18	6.7	2.6	10.5	2.1	2.5	3.4	14.4	4.3	1.9	3.4	5.3
Feb-18	1.9	2.5	2.6	1.3	13.3	6.2	3.6	3.2	2	3.1	2.2
Mar-18	6.1	7.5	4.9	1.5	3.9	1.5	7.8	2.8	2.3	3.8	9.4
Apr-18	1.2	3.4	1.2	0.9	3.4	2.4	4.8	4.5	1.9	4	3.3
May-18	2.3	2.7	1	0.9	1.6	1.9	2	6.9	1.7	3.1	2.8
June-18	1.2	2.4	0.9	0.8	2.1	2.4	3.4	3.1	2.1	4.7	0.8
Jul-18	18.4	3.4	0.9	0.6	3.4	1.1	2.2	2	1.8	5	1.1
Aug-18	5.19	4.01	11.55	1.77	3.63	2.11	3.85	5.08	3.58	4.35	1.94
Sep-18	5.9	9.8	3.6	3.4	4.1	4.4	5.6	3.4	4.3	6.1	3.1
Oct-18	5.9	4.3	11.1	1.7	3.8	4.7	10.8	3.5	3	5.4	2.7
Nov-18	4.3	1.6	3.2	4.1	6.2	5.8	5.5	11.3	4.6	6.8	3.32
Dec-18	18.9	11.1	11.1	2.8	4.2	4.6	5.7	3	47.2*	8	4.3
Jan-19	7.8	2.4	5.6	5.7	9.5	7.8	9.2	6.2	3.3	4	7.6
12 MONTH ROLLING AVERAGE	6.6	4.4	5.2	2.1	4.7	3.7	6.1	4.6	2.7	4.7	3.7

*ALS advised the sample was contaminated and the value is not included in the annual rolling average.

High Volume Air sampler (PM10) Results

The High Volume Air Sampler (HVAS) installed at Coomalgah property monitors level of Particle Matter under 10 micron (PM₁₀). It operates for 24hr every 6 days. Table 4 shows all the 24hr average values recorded for this quarter and the rolling Annual average. Elevated levels of dust were investigated and in all cases wind, grazing or farming activity near the monitor were direct cause of the elevated reading.

Table- 4: HVAS PM10 24 hr average levels for the Quarter

Date	24hr averaged PM10 (µg/m ³)	Criterion 24hr average (µg/m ³)	Rolling Annual average (µg/m ³)	Criterion Annual Average (µg/m ³)	Comments
3/11/2018	44.8	50	17.66	30	No comments
9/11/2018	18.3		17.88		No comments
15/11/2018	66.7		17.83		Windy noted in the field sheet, winds above 7m/s recorded on the day of sampling. Most wind coming from South and West direction. Not mine related. Exclude from annual average.
21/11/2018	41.2		18.44		No comments
27/11/2018	38.2		18.88		No comments
3/12/2018	51.1		18.90		Shed construction near monitor noted in the field sheet by ALS. Wind recorded at the weather station on that day was predominantly coming from South and West of the monitor. Not mine related. Exclude from annual average.
9/12/2018	45.4		19.60		No comments
15/12/2018	175		19.41		Farming activity at Coomalgah, movement of trucks near the monitor. Photos taken as evidence of activity on 11/12. Filter was very dusty (red dirt) noted on the field sheet. Wind recorded was above 7.5m/s. Not mine related. Exclude from annual average
21/12/2018	36.4		19.97		No comments
27/12/2018	111		19.81		Grazing activity and wind noted on the field sheet by ALS. Most wind was coming from East of the monitor according to the weather station. Not mine related. Exclude from annual average.
2/1/2019	34		19.96		No comments
8/1/2019	53.8		19.33		Wind noted in the Field sheet by ALS. Wind and Grazing activity noted in the field sheet by ALS during the filter change on the 02/01/19.. Elevated wind recorded on 7/01/2019 with winds above the 8m/s. Not mine related Exclude from annual average
14/01/2019	88.8		19.08		Most wind was coming from South West on that day. Winds recorded at 7m/s on 13/01. Farming activity and wind noted in the field sheet by ALS on the day of inspection. Not mine related. Exclude from annual average
20/01/2019	34.8		19.46		No comments
26/01/2019	23.7		19.56		No comments

According to the current Air Quality and Greenhouse gas Management Plan, the real time air quality unit (TEOM) installed at the “Flixton” property monitors PM₁₀ levels in ambient air. It is an operational management tool and dust levels nearing or reaching the nominated criteria will trigger actions onsite to assess the source of dust and modify operations if it is determined to be related to Tarrawonga operations.



TEOM installed at Flixton property

Water Monitoring

Groundwater

Routine groundwater monitoring was undertaken in December 2018 and showed in **Table 5** (refer to graphs in *Appendix D*).

Table 5- Groundwater results Summary

Site	Date	SWL (mbgl)	pH (units)	Elect. Conduct (µS/cm)
MW1				
Thuin	September 2017	6.80*	8.31	3370
	December 2017	6.73	7.7	3280
	February 2018	6.81	7.9	3460
	June 2018	6.91	7.9	3350
	September 2018	6.92	7.7	3430
	December 2018	7.03	7.8	3420
MW2				
Thuin	September 2017	3.64	7.54	533
	December 2017	3.68	7	545
	February 2018	4.23	7.3	519
	June 2018	4.67	7.3	547
	September 2018	4.79	6.8	615
	December 2018	3.53	6.8	545
MW4				
Tarrawonga	September 2017	8.9	7.82	4570
	December 2017	8.95	7.2	4440
	February 2018	9.08	7.4	4610
	June 2018	9.14	7.3	4430
	September 2018	9.34	6.9	4560
	December 2018	9.46	7.0	4610
MW5				
Templemore	September 2017	2.75	8.19	2640
	December 2017	2.78	7.7	2630
	February 2018	3.12	7.9	2320
	June 2018	3.31	7.9	1413
	September 2018	3.56	7.8	2040
	December 2018	3.41	7.7	2130
MW6				
Nagero	September 2017	4.57	8.15	1710
	December 2017	4.55	7.6	1738
	February 2018	4.76	7.8	1833
	June 2018	4.75	7.7	1828
	September 2018	4.84	8.0	2090
	December 2018	4.85	7.6	2200
MW7				
Tarrawonga Mine	September 2017	104.47	No sample	No sample
	December 2017	104.53	No sample	No sample
	February 2018	104.97	No sample (Grey mud)	No sample
	June 2018	106.21	No sample (Grey mud)	No sample
	September 2018	104.65	No sample (Grey mud)	No sample
	December 2018	105.01	No sample (Grey mud)	No sample
MW8				
Tarrawonga Mine	September 2017	13.04	Casing blocked	Casing blocked
	December 2017	13.12	Casing blocked	Casing blocked
	February 2018	12.52	Casing blocked	Casing blocked
	June 2018	13.33	Casing blocked	Casing blocked
	September 2018	13.48	Casing blocked	Casing blocked
	December 2018	13.29	Casing blocked	Casing blocked

(*SLR consultant (GM) advised that previously SWL was reported as mbtoc instead of mbgl)

Surface Water

Estimated volume of water stored onsite as 17th January 2019 was approximately **191.2 ML**.

According to the BTM Complex strategy, water sharing opportunity is continuously discussed between the three mines. TCM continue assessing options to source additional water in order to maintain the mine in operation in the long run.

Rehabilitation and Clearing

Rehabilitation

Operations and Environment departments work together to develop and implement a more efficient rehabilitation program. The aim is to enhance the quantity of areas rehabilitated.

In 2018, TCM planted approximately 2,400 trees in the designated rehabilitation areas including Eucalyptus albens, Eucalyptus blakelyi, Eucalyptus crebra, Eucalyptus melliodora, Eucalyptus pilligaensis, Eucalyptus populanea, Eucalyptus macrocarpa, Eucalyptus Melanophloia, Eucalyptus Crebra, Eucalyptus Dealbata and Eucalyptus Dwyeri.

For 2019, 4,200 trees have been ordered and they will be planted in the two waste dump areas before winter.

Clearing

Clearing campaign is planned to start mid-February. According to the current Mining Operations Plan (MOP), only 19.8Ha of disturbance are allowed for 2019. Pre-clearing ecological inspections, RAPS inspections and pre-strip soil testing will be undertaken before the clearing can start. The contractor engaged for the tree clearing will bring all the machines onsite to start clearing from the last week of February.

Complaints

Since the last meeting, no complaint was lodged.

Environmental Management Plans

DPE have contacted TCM to confirm progress on the review of the Management Plan submitted in August 2018. The Department committed to provide some comments by end of March 2019.

TCM have updated Management plans with the assistance of experts. Management Plans submitted at the end of August 2018 to agencies, CCC members (for feedbacks) and DPE (for approval) include:

Noise Management Plan

The Noise management Plan was revised by Todoroski Air Science (TAS).

Blast Management Plan

The Blast Management Plan was revised by TAS.

Air Quality Greenhouse Gas Management Plan

The Air Quality Management Plan was revised by TAS too.

Water Management Plan

The Water management plan was revised by WRM.

BTM Water Strategy

The Draft BTM Water Strategy was sent to CCC members and agencies for consultations in July 2018.

TCM and the other BTM complex mines are currently discussing with DPE and Natural Resources Access Regulator (NRAR) regarding the draft Water Strategy. A teleconference was held in December 2018 between agencies (NRAR, and DPE), BTM mines and the Groundwater Expert (AGE). Agencies will confirm their availability to inspect the 3 mines and then further discussions with the groundwater expert will be required to agree an approach that will address all the concerns raised by agencies and community members.

Annual and Compliance Reporting

Annual Review Report

TCM have started the preparation of the Annual Review due by 31st March.

Annual Return Report

TCM have started the preparation of the Annual Return due by 9th March.

Environmental Improvement and Initiatives

Dust Management

TCM have engaged the company Dust A Side to provide advice and solution to minimise potential fugitive dust generated by exposed surfaces such as haul roads. Since end of April 2018, TCM have been monitoring the results and trying to improve the spraying and mixing techniques. The product used is totally organic, has no corrosive chloride compounds, and is environmentally friendly and readily biodegradable.

Usage of that product on mine haul truck roads is ongoing.

Water Management

TCM have installed marked gauge boards in the authorised discharged dams. This initiative improves water management practices.

Noise Management

The portable noise monitor was relocated few hundreds meter away from farming/ grazing activity zone at Coolmalgah and a new fence was installed around it.

Rehabilitation

TCM have used an ATV to water the rehabilitated areas. That initiative improved the chance of tree survival.

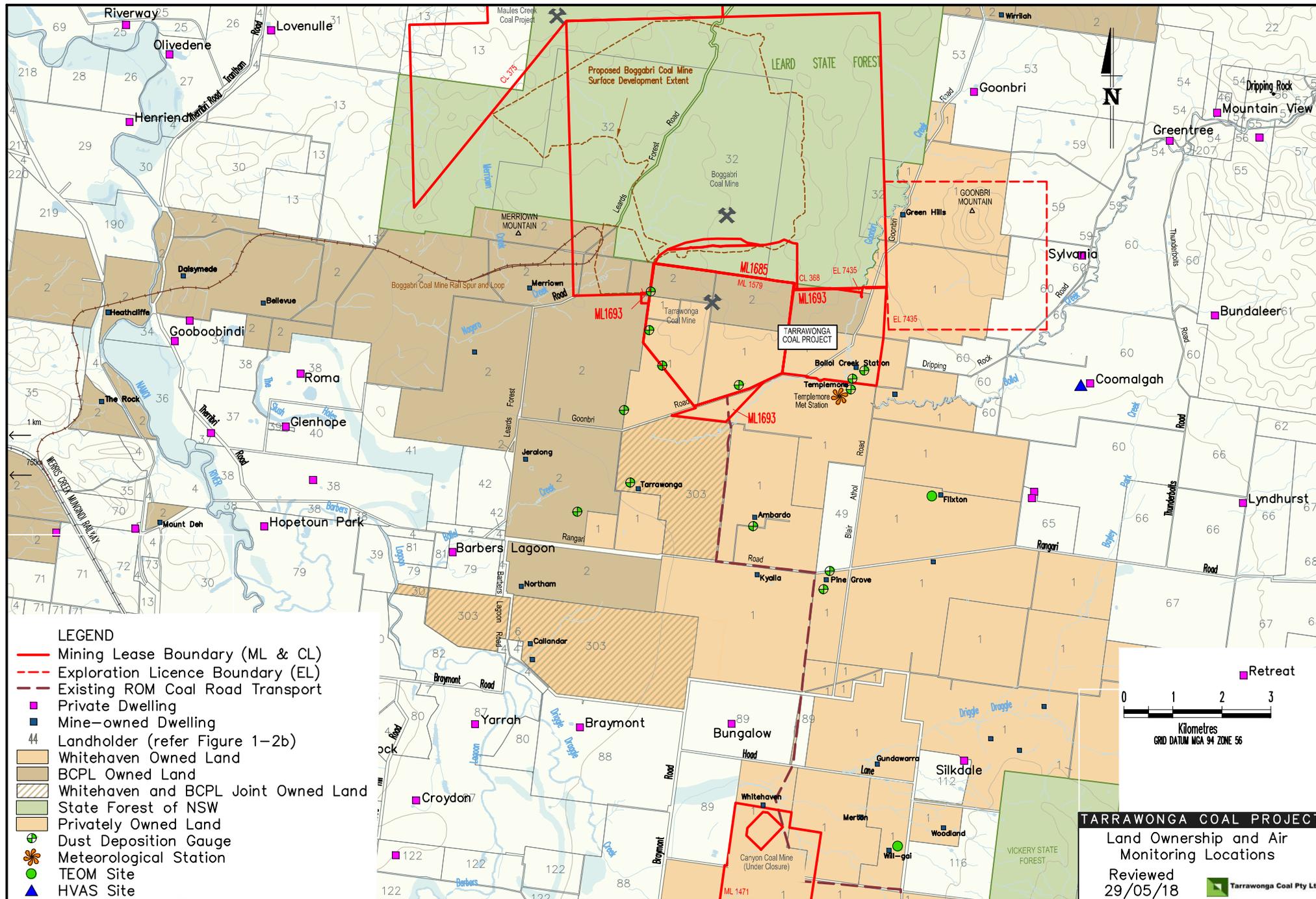
Air Quality

Two Portable dust (PM10) monitors have been ordered to upgrade the air monitoring network. They have been installed and record continuously data



Portable Dust monitor installed at TCM in November 2018

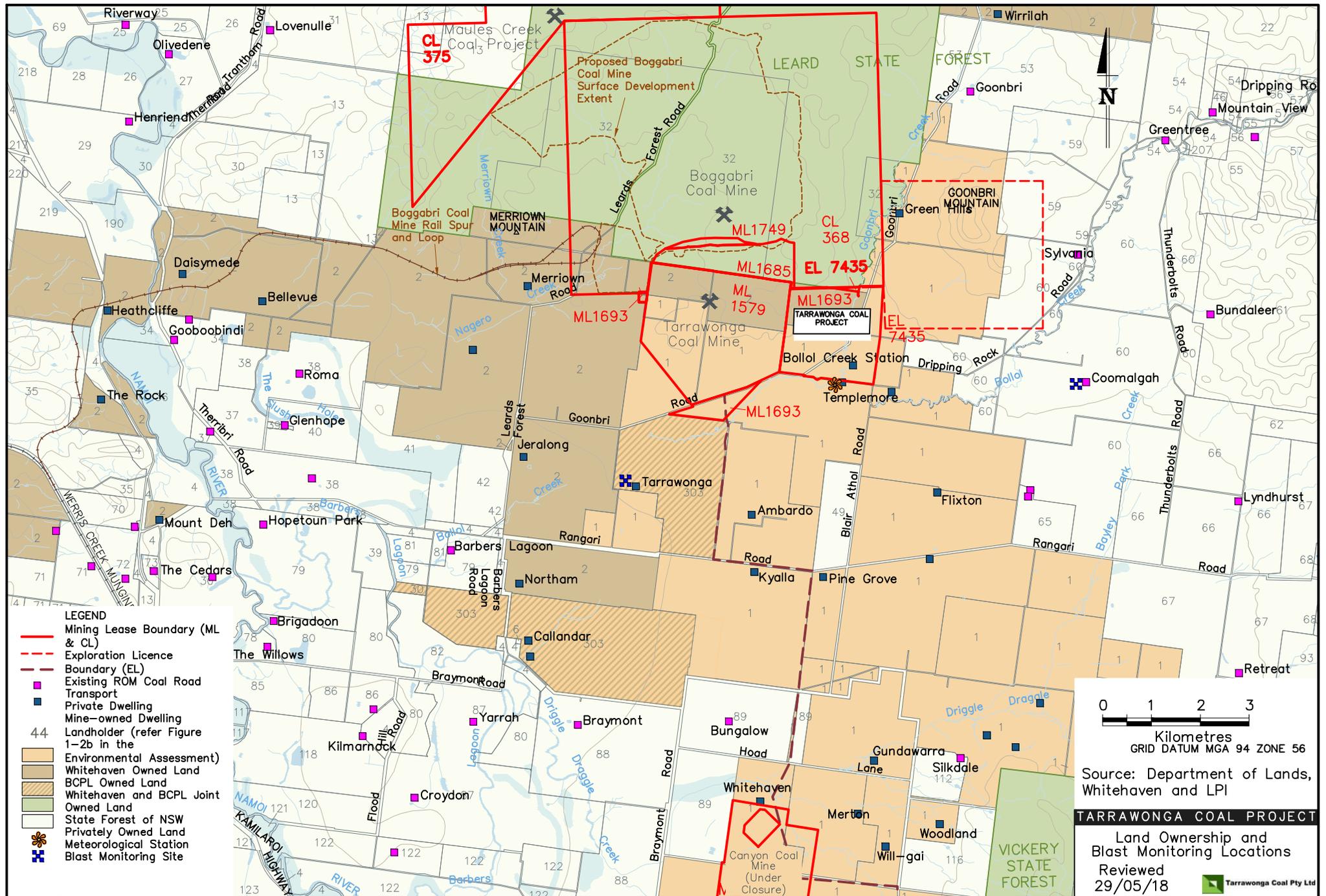
Appendix A

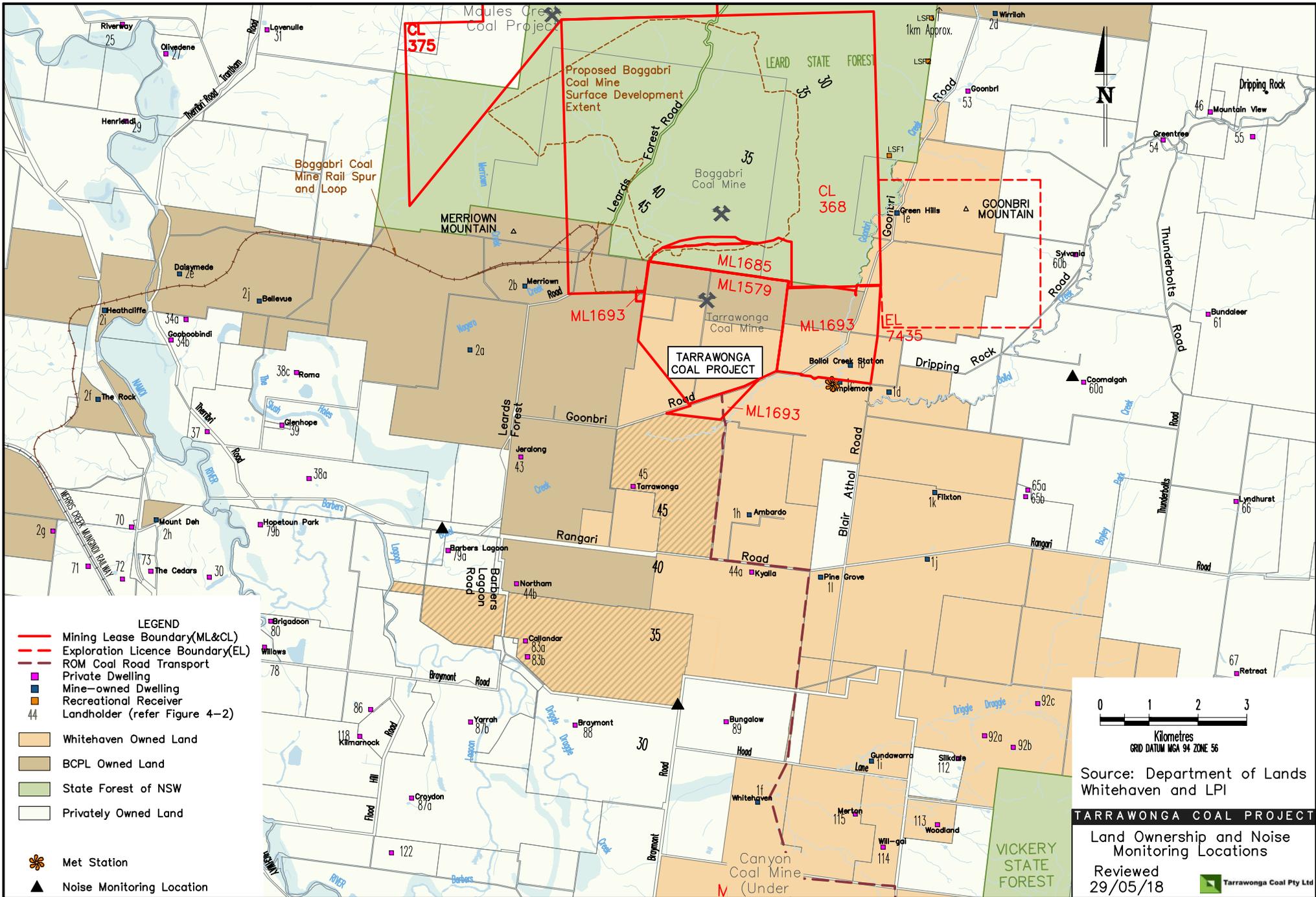


LEGEND

- Mining Lease Boundary (ML & CL)
- - - Exploration Licence Boundary (EL)
- - - Existing ROM Coal Road Transport
- Private Dwelling
- Mine-owned Dwelling
- 44 Landholder (refer Figure 1-2b)
- Whitehaven Owned Land
- BCPL Owned Land
- Whitehaven and BCPL Joint Owned Land
- State Forest of NSW
- Privately Owned Land
- + Dust Deposition Gauge
- ✿ Meteorological Station
- TEOM Site
- ▲ HVAS Site

TARRAWONGA COAL PROJECT
 Land Ownership and Air
 Monitoring Locations
 Reviewed
 29/05/18



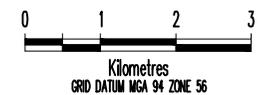


TARRAWONGA COAL PROJECT

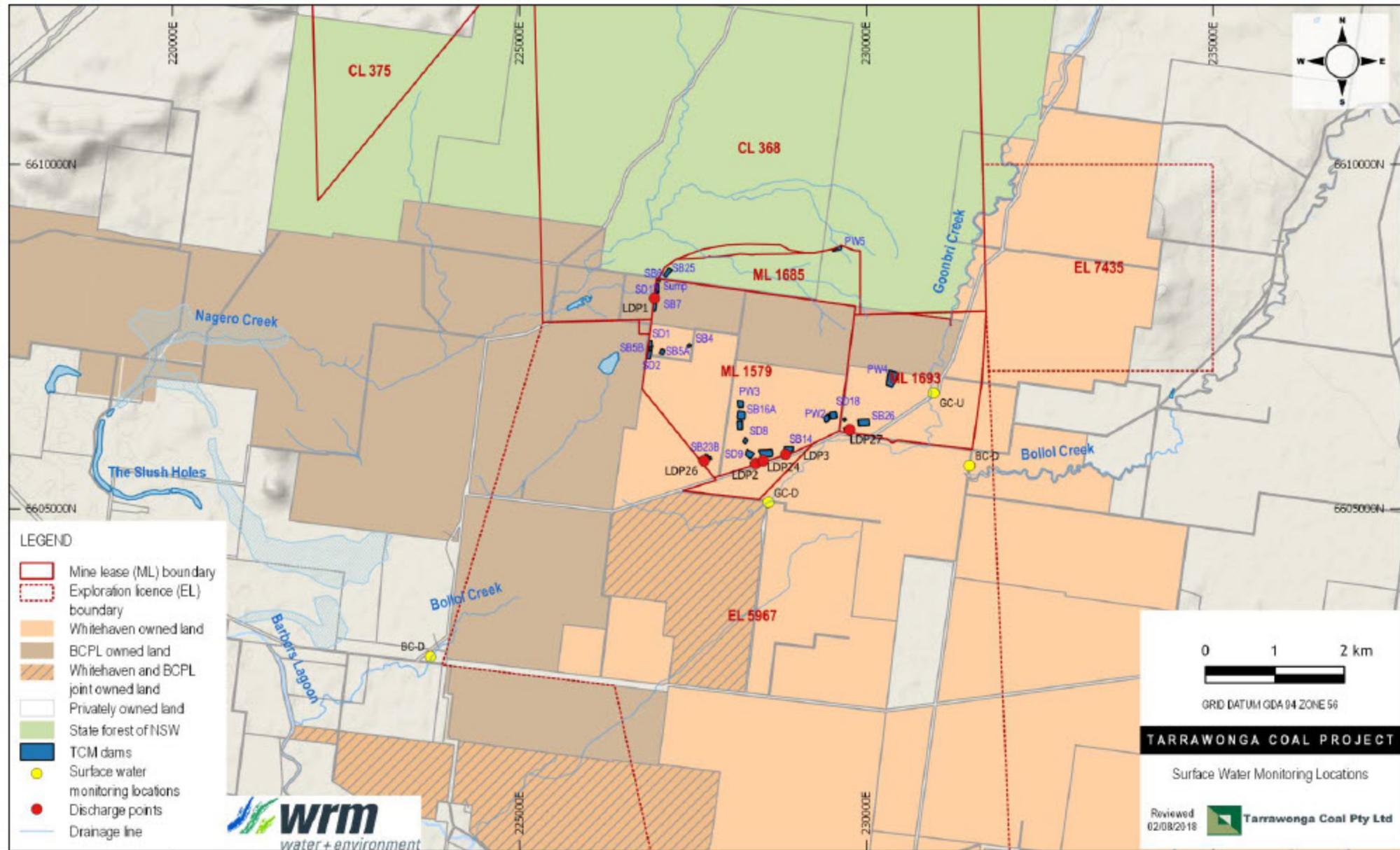
Land Ownership and Noise Monitoring Locations

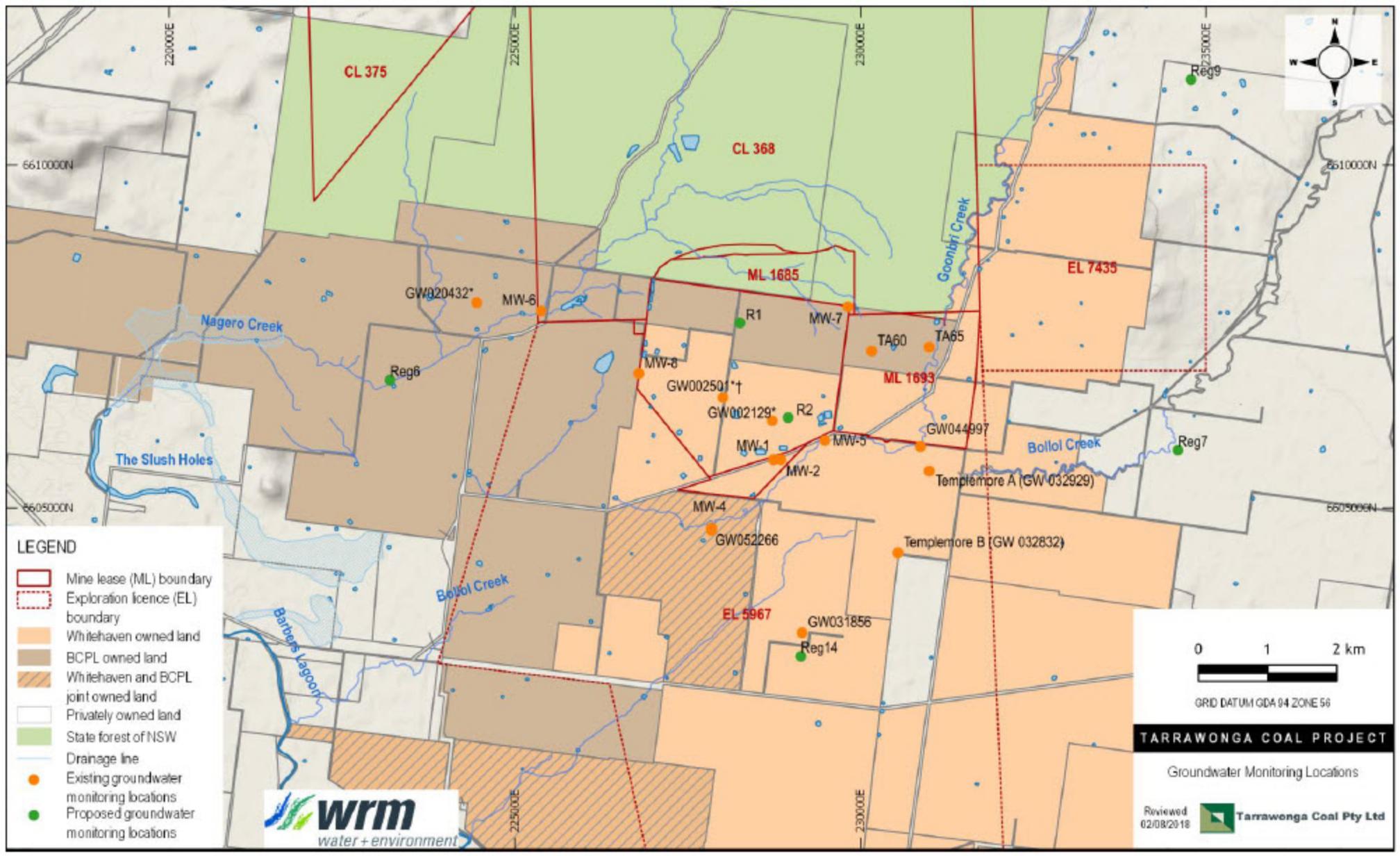
Reviewed 29/05/18

Tarrawonga Coal Pty Ltd



Source: Department of Lands Whitehaven and LPI





LEGEND

- Mine lease (ML) boundary
- Exploration licence (EL) boundary
- Whitehaven owned land
- BCPL owned land
- Whitehaven and BCPL joint owned land
- Privately owned land
- State forest of NSW
- Drainage line
- Existing groundwater monitoring locations
- Proposed groundwater monitoring locations



0 1 2 km

GRID DATUM GDA 94 ZONE 56

TARRAWONGA COAL PROJECT

Groundwater Monitoring Locations

Appendix B

WHITEHAVEN COAL OPERATIONAL NOISE MONITORING

**Road Traffic Noise
December 2018**

Prepared for:

Whitehaven Coal Mining Limited
231 Conadilly Street
GUNNEDAH NSW 2380

SLR Ref: 610.18063-R02
Version No: -v0.1.0
December 2018



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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Whitehaven Coal Mining Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.18063-R02-v1.0	20 December 2018	Jordan Murray	Mark Russell	Mark Russell

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APPENDICES

Appendix A	Acoustic Terminology
Appendix B	Calibration Certificates

1 Introduction

Whitehaven Coal Limited (Whitehaven) has commissioned SLR Consulting Australia Pty Ltd (SLR) to conduct road traffic noise monitoring for residential receivers located along Blue Vale Road, New South Wales (NSW) in accordance with the approved Rocglen Road Traffic Noise Management Plan (RTNMP) dated June 2013, the Rocglen Project Approval (PA 10_0015) and the Tarrawonga Project Approval (PA 11_0047). The RTNMP assesses road traffic noise generated by both Rocglen Coal Mine (RCM) and Tarrawonga Coal Mine (TCM) as required in the Project Approvals. Therefore operator attended road traffic noise monitoring is conducted on Blue Vale Road south of RCM to ensure the measurement of the cumulative effects of both RCM and TCM coal haulage.

The objectives of the noise monitoring programme for this operating period were as follows:

- Conduct operator attended noise surveys at three (3) locations (Brooklyn 1, Brooklyn 2 and Werona) along Blue Vale Road during the approved coal transport times (Day 07:00 – 09:30 or Evening 18:00 – 22:00).
- Quantify the total measured $L_{Aeq}(1hour)$ from all noise sources to allow for the comparison of contribution from coal haul trucks to other sources.
- Assess the $L_{Aeq}(1hour)$ and total number coal haul trucks (identified as empty or full) and determine compliance with respect to the Project Approval limits.

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

2 Performance Assessment and Discussion

Table 1 provides a summary of the attended noise measurements undertaken at each monitoring location. Further details are provided for each location in **Section 5** of this report.

Table 1 Performance Assessment – Operations

Location	Measured Coal Haulage $L_{Aeq}(1hour)$ Contribution dBA		Noise Criteria $L_{Aeq}(1hour)$ dBA	Compliance
	Day	Evening	Day& Evening	
Brooklyn 1	58	_1	60	Y
Brooklyn 2	45	_1	60	Y
Werona	_1	44	60	Y

Note 1: Noise monitoring was not conducted during this period at this location.

3 Noise Criteria

3.1 Project Approval and RTNMP

Noise monitoring was conducted in accordance with the PA 10_0015 and PA 11_0047 requirements and the RTNMP. The site specific PA noise limits are reproduced in **Table 2**.

Table 2 Project Approval Noise Criteria- dBA (re 20 µPa)

Location	Day	Evening	Night
	L _{Aeq} (1hour)	L _{Aeq} (1hour)	L _{Aeq} (1hour)
Any residence on privately owned land	60	60	55

Note: To identify locations see **Figure 1**.
Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Road Traffic Noise Policy.

In the event of a noise criteria exceedance, the RTNMP states:

*If road noise exceeds the levels outlined in **Table 2** advice will be sought from an appropriate acoustic consultant to verify the source of the elevated noise and identify options to address noise related impacts. Such actions may include:*

- *Additional testing to confirm the elevated noise is systemic in nature;*
- *Consideration to changes to operational procedure or equipment type; and*
- *The installation of sound attenuation measures to plant and equipment, where necessary.*

Where it is identified that the above options cannot achieve compliance with noise criteria, RCM will undertake negotiations with the affected landowners with a view to entering into private agreements. Such negotiations would include options with regard to provision of insulation, double-glazing of windows, air-conditioning, or other measures designed to reduce noise impact at the affected property.

4 Attended Road Traffic Noise Monitoring

4.1 General Requirements

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672.1 – 2004 *Electroacoustics—Sound level meters – Specifications*, AS IEC 61672.2-2004, AS IEC 61672.3-2004 and carry current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA.

4.2 Methodology - Operator Attended Noise Monitoring

Noise monitoring was conducted in accordance with the current Rocglen RTNMP.

Operator attended noise measurements were conducted during the day and evening periods for a minimum of one (1) hour at each of the three (3) nominated noise monitoring locations representing the most affected receiver locations. Locations are listed in **Table 3** and shown in **Figure 1**.

During attended monitoring, the following is monitored:

- The total number of truck pass-bys and direction (identified as empty or full) and times of pass-bys.
- Noise levels from coal haulage trucks on Blue Vale Road at residential areas.
- Wind speed and direction.
- Details of any exceptionally noise truck(s).

Table 3 Noise Monitoring Locations

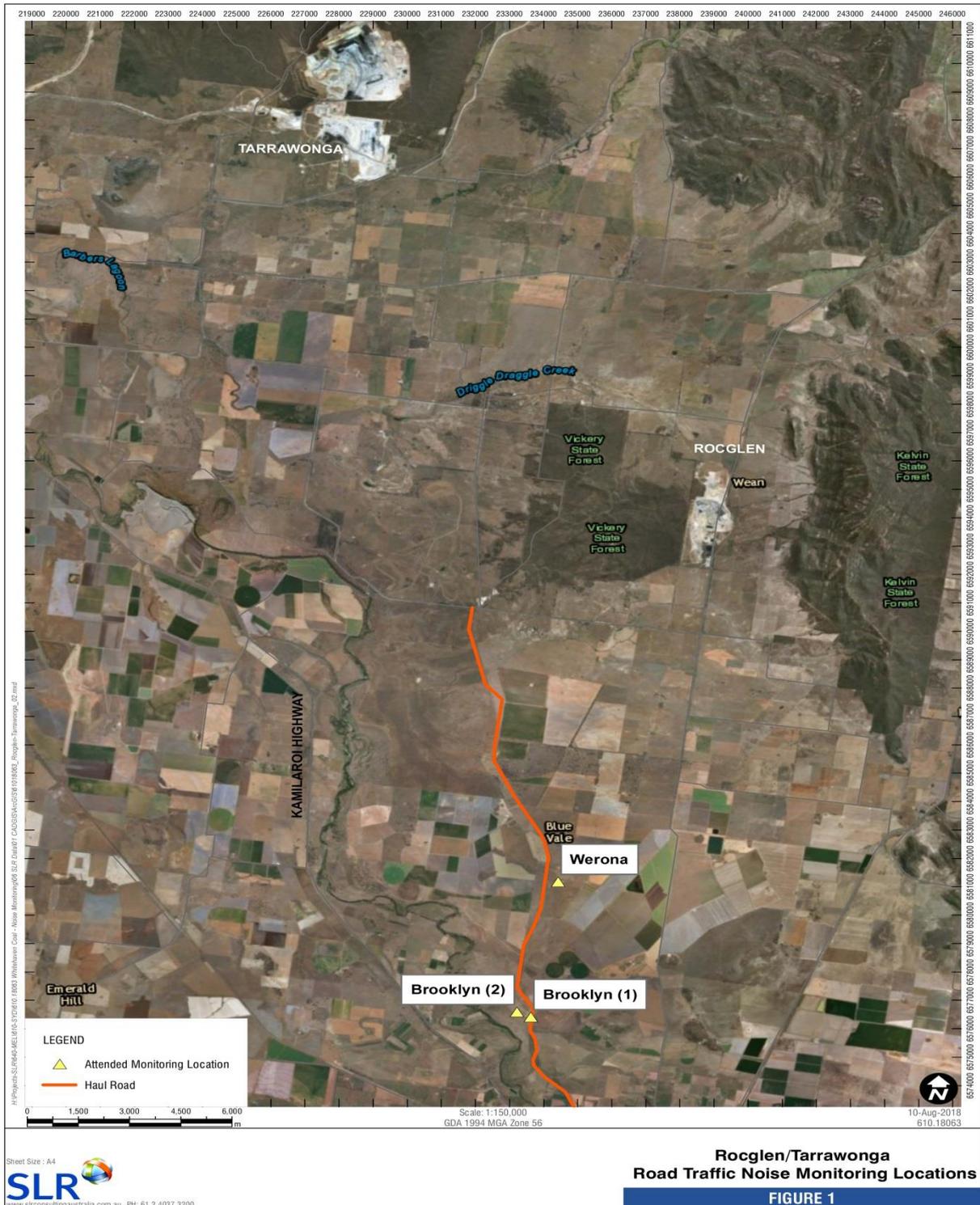
Monitoring Location	Receiver Type	Monitoring Location - MGA Zone 56	
		Easting (m)	Northing (m)
Brooklyn 1	Residence	233621.04	6576425.78
Brooklyn 2	Residence	233222.48	6576596.95
Werona	Residence	234418.00	6581187.17

The objective of the operator attended noise monitoring was to measure $L_{Aeq(1hour)}$ noise level contribution from the coal haul trucks at the nearest potentially affected receptors in order to determine the noise contribution of operational activities associated with coal haulage over each 1 hour measurement period. Operator attended noise measurements were conducted using one-third octave integrating Brüel & Kjær Type 2250L sound level meters (s/n 3004636 and 3005904).

4.3 Data Processing

The data collected during the operator attended noise monitoring was processed using Bruel & Kjaer Evaluator Type 7820-7821. Extraneous noise sources were filtered and an $L_{Aeq(1hour)}$ contribution of coal haulage only was calculated.

Figure 1 Attended Noise Monitoring Locations



5 Results and Discussion

5.1 Results of Operator Attended Monitoring

Operator attended noise measurements were conducted during the day and evening periods commencing on Wednesday 12 December 2018.

Results of the operator attended noise surveys at the three (3) nominated receivers are provided in **Table 4** to **Table 6**.

Ambient noise levels presented include all noise sources such as transport (roads, boats and aircraft), fauna (insects, frogs, birds and bats), the natural environment (wind in trees), domestic noises, other industrial operations as well as noise emissions from coal haulage trucks.

Weather data during the monitoring period has been obtained from the weather station located on the RCM site and observed conditions.

The tables also provide the following information:

- Date and start time, operator and equipment details.
- Monitoring location.
- Wind velocity (m/s) and temperature (°C) at the weather station.
- Typical maximum (L_{Amax}).

5.1.1 Operator Attended Noise Survey Results – Monitoring Location Brooklyn 1

Results of the operator attended noise surveys at Brooklyn 1 are provided in **Table 4**. The monitoring location represents the residential receptor located approximately 90 m west of Blue Vale Road.

Table 4 Operator Attended Noise Survey Results – Brooklyn 1

Period Date/Start Time Weather SLM Details	Criteria – LAeq(1hour) dBA	Total Number of Coal Haul Trucks		Measured LAeq(1hour) dBA		Description of extraneous noise sources - Typical LAmax) noise levels
		Full	Empty	Total	Coal Haulage	
Day 12/12/2018 07:29 1.5 m/s E 24 °C 3004636	60	22	31	58	58	Other road traffic 50-53 Aeroplane 45 Frogs 44-46

5.1.2 Operator Attended Noise Survey Results – Monitoring Location Brooklyn 2

Results of the operator attended noise surveys at Brooklyn (2) are provided in **Table 5**. The monitoring location represents the residential receptor located approximately 480 m west of Blue Vale Road.

Table 5 Operator Attended Noise Survey Results – Brooklyn 2

Period Date/Start Time Weather SLM Details	Criteria – LAeq(1hour) dBA	Total Number of Coal Haul Trucks		Measured LAeq(1hour) dBA		Description of extraneous noise sources - Typical (LAmax) noise levels
		Full	Empty	Total	Coal Haulage	
Evening 12/12/2018 07:32 1.5 m/s E 24 °C 3005904	60	21	30	48	45	Other road traffic 42-46 Birdsong 37-72

5.1.3 Operator Attended Noise Survey Results – Monitoring Location Werona

Results of the operator attended noise surveys at Werona are provided in **Table 6**. The monitoring location represents the residential receptor located approximately 320 m east of Blue Vale Road.

Table 6 Operator Attended Noise Survey Results – Werona

Period Date/Start Time Weather SLM Details	Criteria – LAeq(1hour) dBA	Total Number of Coal Haul Trucks		Measured LAeq(1hour) dBA		Description of extraneous noise sources - Typical (LAmax) noise levels
		Full	Empty	Total	Coal Haulage	
Day 12/12/2018 18:22 2 m/s NW 30 °C 3005904	60	17	18	50	44	Other road traffic 42-49 Birds 49-57 Residential car pass 73

6 Conclusion

SLR was engaged by Whitehaven Coal Limited to conduct road traffic noise monitoring for the Rocglen and Tarrawonga Coal Mines in accordance with the Road Traffic Noise Management Plan and Project Approvals PA 10_0015 and PA 11_0047.

Operator attended noise monitoring was conducted at three (3) locations in order to determine the noise performance of the coal haulage and has found that compliance was achieved at all locations.

WHITEHAVEN COAL OPERATIONAL NOISE MONITORING

**Tarrawonga Coal Mine
Quarter Ending December 2018**

Prepared for:

Whitehaven Coal Mining Limited
10409 Kamilaroi Hwy
GUNNEDAH NSW 2380

SLR Ref: 610.18063-R03
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December 2018



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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Whitehaven Coal Mining Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.18063-R03	20 December 2018	Jason Qian	Mark Russell	Mark Russell

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APPENDICES

Appendix A	Acoustic Terminology
Appendix B	Calibration Certificates

1 Introduction

Whitehaven Coal Limited (Whitehaven) has commissioned SLR Consulting Australia Pty Ltd (SLR) to conduct operational noise monitoring for Tarrawonga Coal Mine (TCM) located approximately 16 km east of Boggabri, New South Wales (NSW) in accordance with the approved Tarrawonga Noise Management Plan (NMP) dated December 2014, the Whitehaven Project Approval (PA 11_0047 – May 2017) and the Environment Protection Licence (EPL) 12365 dated 27/06/2017 (EPL 12365).

The objectives of the noise monitoring programme for this operating period were as follows:

- Conduct operator attended noise surveys at three (3) locations (79a, 89 and 60a) surrounding the mine during the day, evening and night-time periods.
- Quantify all sources of noise within each of the attended noise surveys, including their measured and/or estimated contribution and maximum level of individual noise sources.
- Assess the noise emissions of TCM and determine compliance with respect to the limits contained in Section 2 of the NMP, Schedule 3 - Condition 3 & 6 of the PA and Condition L4.1 of the EPL.

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

2 Performance Assessment and Discussion

The following provides a summary of the attended noise measurements undertaken at each monitoring location. Further details are provided for each location in **Section 5** of this report.

Table 1 Performance Assessment – Operations

EPL ID	Location	Date	Tarrawonga Coal Mine Contribution dBA				Criteria	Measurement Periods	Weather Compliant			Compliant
			LAeq(15minute) Day	LAeq(15minute) Evening	LAeq(15minute) Night	LA1(1minute) Night			Day	Eve	Night	
79a	Barbers Lagoon	10/12/2018	I/A	I/A	I/A	I/A	Day, Evening and Night – 35 dBA LAeq(15minute)	Day - 1.5 hrs Evening - 0.5 hrs Night – 1hrs	Yes	No	Yes	Yes
		11/12/2018	31	I/A	34	44			Yes	No	Yes	Yes
		12/12/2018	I/A	28	26	35			Yes	Ye	No	Yes
		13/12/2018	30	N/M	I/A	I/A			Yes	Yes	Yes	Yes
89	Bungalow	10/12/2018	28	I/A	I/A	I/A	Night – 45 dBA LA1(1minute) Cumulative Day, Evening, Night 40 dBA LAeq(15minute)		No	Yes	No	Yes
		11/12/2018	I/A	I/A	28	42			No	No	No	Yes
		12/12/2018	I/A	25	25	32			Yes	Yes	Yes	Yes
		13/12/2018	I/A	I/A	30	38			No	No	Yes	Yes
60a	Coomalgah/ Matong	10/12/2018	32	I/A	I/A	I/A			Yes	Yes	No	Yes
		11/12/2018	I/A	I/A	30	43			No	Yes	No	Yes
		12/12/2018	27	I/A	I/A	I/A			Yes	Yes	Yes	Yes
		13/12/2018	26	I/A	32	I/A			No	Yes	Yes	Yes

Note:

I/A = Inaudible

N/M = Not Measurable

3 Noise Criteria

3.1 Project Approval, EPL and NMP

Noise monitoring at TCM was conducted in accordance with the EPL 12365, the PA 11_0047 requirements and the NMP. The site specific EPL and PA noise limits are summarised in Section 2 of the NMP and are reproduced in **Table 2**.

Table 2 Project Approval and EPL Noise Criteria- dBA (re 20 µPa)

Location	Day	Cumulative Criteria1	Evening	Night	
	LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LA1(1minute)
All Privately owned Residences	35 dBA	40 dBA	35 dBA	35 dBA	45 dBA

Note 1. Cumulative noise criteria to include noise generated by other mines

3.1.1 Non-compliances & Exemptions

In accordance with Section 11.1.3 of the Noise Policy for Industry (NPfI) a development is deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence. This may occur for two reasons:

- The noise from the TCM is excessive, in which case TCM will be not complying with its consent or licence condition.
- The noise was increased by extreme, nonstandard weather effects—in which case the TCM is not considered to be in non-compliance with its consent or licence condition.

In this latter case, further monitoring at a later date is required to determine compliance under “normal” meteorological conditions.

The NPfI states in Section 9.2 that *“it is not practicable to meet the noise limit under all inversion events; hence exceedances under extreme temperature inversions are not considered to be a non-compliance with consent or licence conditions.”*

TCM defines non standard weather effects as:

- Wind speeds greater than 3 m/s at 10m above ground level; or
- Stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 metres above ground level; or
- Stability category G temperature inversion conditions

3.1.2 Attended Monitoring

TCM will be undertaking Attended Noise monitoring on a quarterly basis at residential areas. The attended monitoring will take place at the following locations & can be found in **Figure 1**.

- Barbers Lagoon – 6412 Rangari Road
- Bungalow – 1216 Braymont Road
- Coolmagah/Matong – Eastern boundary

This monitoring will involve Day, Evening and Night Attended monitoring to determine the $L_{Aeq(15\text{minute})}$. During attended monitoring, the following is to be monitored:

- Noise levels from TCM at residential areas.
- wind speed and direction.
- Sky cloud cover, using direct observation for night measurements.

4 Operational Noise Monitoring Methodology

4.1 General Requirements

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672.1 – 2004 *Electroacoustics—Sound level meters – Specifications*, AS IEC 61672.2-2004, AS IEC 61672.3-2004 and carried current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ± 0.5 dBA. Calibration Sheets are provided in **Appendix B**.

4.2 Methodology - Operator Attended Noise Monitoring

Noise monitoring was conducted in accordance with the current Tarrawonga NMP, and Conditions M7.1 and M7.4 of the EPL.

Operator attended noise measurements were conducted during the day, evening and night-time periods for a minimum of 1.5 hours during the day; 30 minutes during the evening and 1 hour during the night at each of the three (3) nominated noise monitoring locations representing the most affected receiver locations, listed in **Table 3** and shown in **Figure 1**. During the operator attended noise measurements, the character and relative contribution of ambient noise sources and mine contributions were determined.

Table 3 Noise Monitoring Locations

Monitoring Location	Receiver Type	Address	Monitoring Location - MGA Zone 56	
			Easting (m)	Northing (m)
79a	Residence	Barbers Lagoon – 6145 Rangari Road	222934	6602484
89	Residence	Bungalow – 1216 Braymont Road	227596	6599265
60a	Residence	Matong/Coomalgah – Eastern boundary	233182	6606083

The objective of the operator attended noise monitoring was to measure the maximum (L_{Amax}) and the $L_{Aeq(15minute)}$ noise level contribution from the TCM at the nearest potentially affected receptors in order to determine the noise contribution of operational activities associated with TCM operations over each 15 minute measurement period. In addition, the operator quantifies and characterises the overall levels of ambient noise in the area (i.e. L_{Amax} , $LA1$, $LA10$, $LA90$, L_{Aeq} and L_{Amin}) over the 15 minute measurement interval.

Operator attended noise measurements were conducted using a one-third octave integrating Brüel & Kjær Type 2250 Sound Level Meters (SLM) and a one-third octave integrating Brüel & Kjær Type 2270 SLM (serial numbers 3004636, 3005904 & 3008204 respectively).

Table 4 presents a summary of which days of the week the quarterly monitoring was conducted, in accordance with condition M7.5 of EPL 12365.

Table 4 Days of the Week Quarterly Monitoring was Conducted, Year 2018

Period	Day of the Week					
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Day	10 December 2018	11 December 2018	12 December 2018	13 December 2018		
Evening	10 December 2018	11 December 2018	12 December 2018	13 December 2018		
Night ¹	10 December 2018	11 December 2018	12 December 2018	13 December 2018		

1. Taken to mean the night time period from 10:00 pm on the stated day to 7:00 am the following day.

Figure 1 Tarrawonga Coal Mine Attended Noise Monitoring Locations



5 Results and Discussion

5.1 Results of Operator Attended Monitoring

Results of the operator attended noise surveys at Barbers Lagoon, Bungalow and Matong/Coomalgah are provided in **Table 5** to **Table 16**.

Ambient noise levels presented include all noise sources such as transport (roads, boats and aircraft), fauna (insects, frogs, birds and bats), the natural environment (wind in trees), domestic noises, other industrial operations as well as TCM noise emissions.

Weather data during the monitoring period has been obtained from the weather station located on the TCM site and observed conditions.

The tables also provide the following information:

- Date and start time, operator and equipment details.
- Monitoring location.
- Wind velocity (m/s) and temperature (°C) at the weather station.
- Typical maximum (L_{Amax}) and contributed $L_{Aeq(15minute)}$ noise levels.

5.1.1 Operator Attended Noise Survey Results – Barbers Lagoon (79a)

Results of the operator attended noise surveys at R1 are provided in **Table 5** to **Table 8**. Monitoring location 79a represents residential receptors located to the southwest of the site in Barbers Lagoon.

Table 5 Operator Attended Noise Survey Results – 79a – Barbers Lagoon (Day 1)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution (dB)	Description
				LAmx	LA1	LA10	LA90	LAeq	LAmIn		
Day 10/12/2018 8:28 2-3 m/s W 31 °C	35 dBA LAeq(15minute)	1	A	72	60	47	37	47	32	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind related noise: 43-61 Birds: 50-73 Farm animal: 48-56 Traffic noise: 54-66 Airplane: 72
		2	A	72	62	49	37	49	33	I/A	
		3	A	69	62	54	38	51	32	I/A	
		4	A	73	63	54	42	52	36	I/A	
		5	A	70	59	52	43	50	38	I/A	
		6	A	72	64	55	45	54	39	I/A	
Evening 10/12/2018 20:41 6 m/s NNE 29°C	35 dBA LAeq(15minute)	1	D	65	61	57	44	53	39	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind 40-62 Dog 54-60
		2	D	68	65	61	50	57	48	I/A	
Night 10/12/2018 23:30 3 m/s E 27 °C	35 dBA LAeq(15minute)	1	D	60	48	42	36	40	34	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind related noise 35-64 Insects 40-42 Road traffic 48-54
		2	D	56	47	44	36	40	34	I/A	
	3	D	60	49	46	37	42	33	I/A		
	4	D	64	53	45	34	43	32	I/A		
	45 dBA LA1(1minute)										

N/M = Not Measurable

I/A = Inaudible

Table 6 Operator Attended Noise Survey Results – 79a – Barbers Lagoon (Day 2)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution	Description
				LAmx	LA1	LA10	LA90	LAeq	LAmín		
Day 11/12/2018 09:42 3-4 m/s ESE 27 °C	35 dBA LAeq(15minute)	1	D	64	52	46	39	44	35	N/M	Site Related Noise Events: Haul truck: 35-40 Reverse horn: 38 Other Noise Events: Wind related noise: 40-57 Farm animal: 45-48 -72 Traffic: 42-49
		2	D	65	52	47	38	43	35	N/M	
		3	C	72	54	45	36	45	32	31	
		4	C	69	57	44	36	45	33	31	
		5	C	72	67	48	35	52	31	I/A	
		6	B	75	59	45	35	45	30	I/A	
Evening 11/12/2018 19:50 5 m/s SE 22 °C	35 dBA LAeq(15minute)	1	C	87	72	63	44	61	40	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind related noise: 50-53 Birds: 54-67 Dog: 60-87 Traffic: 50-74
		2	D	70	60	50	39	50	33	I/A	
Night 12/12/2018 00:29 3 - 4 m/s ESE 20 °C	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	D	53	44	41	36	39	34	LAeq: 34dBA LA1: 44 dBA	Site Related Noise Events: Haul truck: 36-39 Mine noise: 42-44 Other Noise Events: Insects: 36-37 Rain: 39-53 Animal: 49
		2	E	51	41	38	36	37	33	LAeq: 34 dBA LA1: 44 dBA	
		3	D	49	41	38	35	37	41	LAeq: 33 dBA LA1:41 dBA	
		4	D	44	41	39	36	38	34	LAeq: 33 dBA LA1: 44 dBA	

N/M = Not Measurable

I/A = Inaudible

Table 7 Operator Attended Noise Survey Results – 79a – Barbers Lagoon (Day 3)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution (dB)	Description
				LAmax	LA1	LA10	LA90	LAeq	L Amin		
Day 12/12/2018 13:38 2-4 m/s SE 30 °C	35 dBA LAeq(15minute)	1	A	67	48	49	36	47	31	I/A	Site Related Noise Events: Inaudible Other Noise Events: Insects 39-46 Birdsong 34-43 Road traffic 57-87 Farm operations 41-72
		2	A	87	66	45	37	55	34	I/A	
		3	A	71	55	49	36	45	33	I/A	
		4	A	57	49	45	36	42	33	I/A	
		5	A	68	57	52	39	48	27	I/A	
		6	C	61	54	50	41	47	37	I/A	
Evening 12/12/2018 19:50 2-3 m/s NE 27 °C	35 dBA LAeq(15minute)	1	C	69	57	45	37	45	33	28	Site Related Noise Events: Haul truck: 36-38 Other Noise Events: Wind related noise:45-47 Birds: 40-69 Farm animal: 37-47 Insects: 40-41
		2	B	62	52	43	37	42	34	28	
Night 13/12/2018 00:27 3 m/s NNW 25 °C	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	E	57	37	35	30	33	29	LAeq: 26 dBA LA1: 35 dBA	Site Related Noise Events: Haul truck: 30-35 Other Noise Events: Animal: 32-57 Rain: 42-47 Insects: 31-35 Traffic: 41
		2	E	47	44	40	31	36	28	LAeq: 25 dBA LA1: 31dBA	
		3	F	57	43	40	32	36	30	LAeq: 25 dBA LA1: 32 dBA	
		4	F	51	38	34	30	32	28	LAeq: 25 dBA LA1 31 dBA	

N/M = Not Measurable

I/A = Inaudible

Table 8 Operator Attended Noise Survey Results – 79a – Barbers Lagoon (Day 4)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution (dB)	Description
				LAmx	LA1	LA10	LA90	LAeq	LAmn		
Day 13/12/2018 08:15 3 m/s N 25 °C	35 dBA LAeq(15minute)	1	A	61	54	47	35	44	32	30	Site Related Noise Events: Haul truck 33-37 Other Noise Events: Farm animal: 43-75 Birds: 43-79 Traffic: 40-47 Owner of Barbers Lagoon: 40-65
		2	B	75	34	59	48	47	38	30	
		3	A	79	69	49	38	56	34	I/A	
		4	B	57	53	44	35	42	31	I/A	
		5	A	66	56	46	35	44	32	I/A	
		6	A	69	59	47	37	47	33	I/A	
Evening 13/12/2018 19:22 2 – 3 m/s N 14 °C	35 dBA LAeq(15minute)	1	A	74	59	51	38	48	30	N/M	Site Related Noise Events: Not Measureable Other Noise Events: Birdsong 32-54 Wind 33-36 Insects 35 Road traffic 39-50
		2	B	73	58	52	36	48	28	N/M	
Night 13/12/2018 23:29 3 m/s N 23 °C	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	D	52	51	45	36	42	34	I/A	Site Related Noise Events: Not Measureable Other Noise Events: Wind related noise 33-58 Bats 58 Road traffic 48
		2	D	53	49	46	39	43	36	I/A	
		3	E	53	47	43	35	40	33	I/A	
		4	D	58	48	44	37	34	41	N/M	

N/M = Not Measurable

I/A = Inaudible

5.1.2 Operator Attended Noise Survey Results – Bungalow (89)

Results of the operator attended noise surveys at R1 are provided in **Table 9** to **Table 12**. Monitoring location 89 represents residential receptors located to the south of the site in Bungalow.

Table 9 Operator Attended Noise Survey Results – 89 – Bungalow (Day 1)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution	Description
				LAmax	LA1	LA10	LA90	LAeq	L Amin		
Day 10/12/2018 10:41 5 m/s WSW 31 °C	35 dBA LAeq(15minute)	1	C	65	55	46	37	45	34	I/A	Site related noise: Haul truck: 30 Other noise events: Wind related noise: 40-49 Birds: 40-57 Traffic noise: 52-69 Insects: 41-47
		2	C	58	52	46	37	43	33	I/A	
		3	C	58	47	43	29	39	25	I/A	
		4	C	69	58	45	36	47	32	I/A	
		5	C	54	46	43	30	39	27	I/A	
		6	C	68	56	46	32	45	26	28	
Evening 10/12/2018 19:44 1 m/s N 30 °C	35 dBA LAeq(15minute)	1	D	61	46	43	27	38	24	I/A	Site Related Noise Events: Inaudible Other Noise Events: Insects 39-45 Birds 41-55 Traffic 25-30
		2	C	50	47	46	38	43	31	I/A	
Night 10/12/2018 22:12 6 m/s E 29 °C	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	D	62	58	56	49	53	46	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind 40-62
		2	D	60	57	55	48	52	45	I/A	
		3	D	58	53	51	44	48	41	I/A	
		4	D	56	53	50	43	47	40	I/A	

N/M = Not Measurable, I/A = Inaudible

Table 10 Operator Attended Noise Survey Results – 89 – Bungalow (Day 2)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution	Description
				LAmax	LA1	LA10	LA90	LAeq	L Amin		
Day 11/12/2018 09:47 4 m/s ESE 28 °C	35 dBA LAeq(15minute)	1	D	63	54	44	32	42	28	N/M	Site Related Noise Events: Not Measureable Other Noise Events: Road traffic 40-71 Birdsong 38-50 Wind related noise 48-81
		2	D	63	55	40	32	41	29	N/M	
		3	C	68	53	49	39	46	35	I/A	
		4	C	68	61	58	49	55	42	I/A	
		5	C	75	60	58	49	55	42	I/A	
		6	B	81	60	56	50	55	46	I/A	
Evening 11/12/2018 20:32 4 m/s SE 22 °C	35 dBA LAeq(15minute)	1	D	50	45	41	36	39	32	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind related noise: 38-50 Insects: 37-40 Traffic: 40 Non-relevant noise: 49
		2	D	50	46	43	39	42	35	I/A	
Night 11/12/2018 23:18 4 m/s ESE 20 °C	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	D	44	42	41	31	37	29	LAeq: 27 dBA LA1: 36 dBA	Site Related Noise Events: Haul truck: 33-42 Other Noise Events: Insects: 37-43 Animal: 41-48 Traffic: 37
		2	D	44	43	41	32	38	28	LAeq: 27 dBA LA1: 34 dBA	
		3	E	48	41	40	32	36	29	LAeq: 28 dBA LA1: 36 dBA	
		4	D	44	42	39	34	37	31	LAeq:28 dBA LA1: 42 dBA	

N/M = Not Measurable, I/A = Inaudible

Table 11 Operator Attended Noise Survey Results – 89 – Bungalow (Day 3)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution	Description
				LAm _{ax}	LA ₁	LA ₁₀	LA ₉₀	LA _{eq}	LA _{min}		
Day 12/12/2018 13:38 0 - 4 m/s NW 32 °C	35 dBA LA _{eq} (15minute)	1	A	75	49	39	29	46	25	I/A	Site Related Noise Events: Inaudible Other Noise Events: Birdsong 33-71 Insect 35 Road traffic 63-75
		2	A	74	62	41	28	48	24	I/A	
		3	A	71	56	45	31	44	27	I/A	
		4	A	64	55	47	28	43	24	I/A	
		5	C	65	55	36	26	41	23	I/A	
		6	D	75	61	44	27	48	23	I/A	
Evening 12/12/2018 20:33 2 m/s N 27 °C	35 dBA LA _{eq} (15minute)	1	A	50	49	46	37	43	33	25	Site Related Noise Events: Haul truck: 30-33 Horn: 42 Other Noise Events: Insects: 40-50
		2	B	47	46	44	37	42	35	25	
Night 12/12/2018 23:17 3 m/s NE 25 °C	35 dBA LA _{eq} (15minute) 45 dBA LA ₁ (1minute)	1	D	53	45	44	38	42	35	I/A	Site Related Noise Events: Haul truck: 30-35 Other Noise Events: Wind related noise: 40-47 Insects: 39-43 Animal: 53
		2	D	53	45	44	37	41	32	I/A	
		3	D	47	45	41	35	39	31	LA _{eq} : 25 LA ₁ : 35	
		4	D	47	45	43	36	41	31	LA _{eq} : 25 LA ₁ : 32	

N/M = Not Measurable I/A = Inaudible

Table 12 Operator Attended Noise Survey Results – 89 – Bungalow (Day 4)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution	Description
				L _{Amax}	L _{A1}	L _{A10}	L _{A90}	L _{Aeq}	L _{Amin}		
Day 13/12/2018 09:45 4 - 7 m/s SW 30 °C	35 dBA L _{Aeq} (15minute)	1	B	72	56	47	35	45	29	N/M	Site Related Noise Events: Not Measureable Other Noise Events: Road traffic 60-77 Aeroplane 35-40 Birdsong 35-72 Wind related noise 38-60
		2	C	76	69	49	35	53	31	I/A	
		3	D	66	61	58	46	54	41	I/A	
		4	D	72	66	60	48	56	44	I/A	
		5	D	68	64	60	52	57	48	I/A	
		6	D	77	62	60	51	57	48	I/A	
Evening 13/12/2018 20:55 4 m/s N 23 °C	35 dBA L _{Aeq} (15minute)	1	D	58	42	39	34	42	31	I/A	Site Related Noise Events: Not Measureable Other Noise Events: Road traffic 33-37 Insects 37-40 Wind related noise 38-42
		2	D	54	42	40	33	37	30	N/M	
Night 13/12/2018 00:44 3 m/s N 22 °C	35 dBA L _{Aeq} (15minute) 45 dBA L _{A1} (1minute)	1	D	53	38	35	31	34	29	L _{Aeq} : 30 L _{A1} : 38	Site Related Noise Events: General site emissions 30-32 Other Noise Events: Other industry 29-30 Insects 34-37 Wind related noise 36-48
		2	D	53	44	37	33	36	30	N/M	
		3	D	65	49	45	35	42	30	I/A	
		4	D	56	53	51	43	48	40	I/A	

N/M = Not Measurable

I/A = Inaudible

5.1.3 Operator Attended Noise Survey Results – Matong/Coomalgah (60a)

Results of the operator attended noise surveys at R1 are provided in **Table 13** to **Table 16**. Monitoring location 60a represents residential receptors located to the east of the site at the Matong/Coomalgah boundary.

Table 13 Operator Attended Noise Survey Results – 60a – Matong/Coolmalgah (Day 1)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution	Description
				L _{Amax}	L _{A1}	L _{A10}	L _{A90}	L _{Aeq}	L _{Amin}		
Day 10/12/2018 12:53 3 m/s S 31 °C	35 dBA L _{Aeq} (15minute)	1	A	48	42	38	31	35	27	32	Site Related Noise Events: Haul truck: 28-35 Other Noise Events: Wind related noise: 40-53 Birds: 36-58 Traffic noise: 42-74 Insects: 43-49
		2	C	74	49	38	29	45	25	32	
		3	B	53	45	40	29	37	25	29	
		4	B	58	41	37	27	34	23	29	
		5	A	50	41	35	25	32	23	28	
		6	A	48	41	36	29	34	25	30	
Evening 10/12/2018 19:46 1 m/s NE 30 °C	35 dBA L _{Aeq} (15minute)	1	NE	47	37	30	24	28	22	I/A	Site Related Noise Events: Not Measureable Other Noise Events: Birdsong 33-52 Wind related noise 28-34 Insects 28
		2	NNE	52	47	29	24	31	23	N/M	
Night 10/12/2018 22:00 7 m/s E 30 °C	35 dBA L _{Aeq} (15minute) 45 dBA L _{A1} (1minute)	1	D	68	52	48	40	45	37	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind related noise 37-68 Road traffic 62-75
		2	D	68	56	50	44	48	41	I/A	
		3	D	75	55	47	40	48	38	I/A	
		4	D	73	51	44	37	45	35	I/A	

N/M = Not Measurable, I/A = Inaudible

Table 14 Operator Attended Noise Survey Results – 60a – Matong/Coolmalgah (Day 2)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution (dBA)	Description
				LAm _{ax}	LA ₁	LA ₁₀	LA ₉₀	LA _{eq}	LA _{min}		
Day 11/12/2018 09:44 4-5 m/s ESE 27 °C	35 dBA LA _{eq} (15minute)	1	D	72	43	37	30	38	27	I/A	Site Related Noise Events: Inaudible Other Noise Events: Other industry 31-34 Birdsong 36-72
		2	D	79	56	42	29	50	26	I/A	
		3	C	67	51	40	29	39	26	I/A	
		4	C	57	46	37	28	35	24	I/A	
		5	C	80	54	38	28	50	24	I/A	
		6	B	61	47	35	27	35	24	I/A	
Evening 11/12/2018 21:24 3 m/s 22 °C	35 dBA LA _{eq} (15minute)	1	D	51	49	43	35	40	51	I/A	Site Related Noise Events: Inaudible Other Noise Events: Insects: 36-38 Traffic: 42-51
		2	D	50	48	43	36	40	33	I/A	
Night 11/12/2018 22:00 4 m/s ESE 22 °C	35 dBA LA _{eq} (15minute) 45 dBA LA ₁ (1minute)	1	D	47	43	38	33	36	29	LA _{eq} : 30 LA ₁ : 43	Site Related Noise Events: Haul truck: 30-39 Other Noise Events: Wind related noise: 36-40 Insects: 35-40 Traffic: 38-47
		2	D	41	38	36	31	34	28	LA _{eq} : 30 LA ₁ : 41	
		3	D	43	38	36	32	34	29	LA _{eq} : 31 LA ₁ : 39	
		4	D	47	41	37	32	35	29	LA _{eq} :31 LA ₁ : 40	

N/M = Not Measurable

I/A = Inaudible

Table 15 Operator Attended Noise Survey Results – 60a – Matong/Coolmalgah (Day 3)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution	Description
				LAmax	LA1	LA10	LA90	LAeq	L Amin		
Day 12/12/2018 11:40 0-2 m/s NW 30 °C	35 dBA LAeq(15minute)	1	A	76	58	43	27	49	23	N/M	Site Related Noise Events: General truck noise briefly audible 28-30 Other Noise Events: Wind_40 Road traffic 60-76 Birdsong 31-36 Insects 39 Aeroplane 36-50
		2	A	48	42	39	27	32	23	N/M	
		3	A	56	46	39	29	37	25	N/M	
		4	A	67	44	37	27	36	24	27	
		5	A	54	43	35	26	32	22	N/M	
		6	A	67	43	35	26	34	23	N/M	
Evening 12/12/2018 21:24 2-3 m/s NNE 25 °C	35 dBA LAeq(15minute)	1	E	49	40	38	35	37	33	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind related noise: 35-36 Insects:35-42 Traffic: 67
		2	E	67	56	38	33	42	31	I/A	
Night 12/12/2018 22:00 2 - 3 m/s E 25 °C	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	E	72	52	37	30	45	37	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind related noise: 39-51 Insects: 35-37 Animal:50-53 Traffic: 72
		2	F	53	42	37	34	37	31	I/A	
		3	F	46	41	38	34	36	30	I/A	
		4	E	51	32	45	40	38	35	I/A	

N/M = Not Measurable, I/A = Inaudible

Table 16 Operator Attended Noise Survey Results – 60a – Matong/Coolmalgah (Day 4)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						TCM Contribution	Description
				LAmax	LA1	LA10	LA90	LAeq	L Amin		
Day 13/12/2018 10:03 5 m/s WNW 30°C	35 dBA LAeq(15minute)	1	C	60	50	45	35	41	32	26	Site Related Noise Events: Haul truck: 30-32 Other Noise Events: Wind: 45-65 Birds:46-65 Traffic: 68
		2	D	68	57	50	42	48	38	I/A	
		3	D	63	56	50	40	47	36	I/A	
		4	D	64	59	54	45	51	42	I/A	
		5	D	65	57	43	42	50	39	I/A	
		6	D	65	56	51	42	48	38	I/A	
Evening 13/12/2018 18:42 2 – 3m/s 24 °C	35 dBA LAeq(15minute)	1	B	71	44	41	35	40	32	32	Site Related Noise Events: General truck noise emissions 28-33 Other Noise Events: Other industry 29-35 Insects 40-41 Birdsong 40-71
		2	B	57	45	39	34	37	30	29	
Night 13/12/2018 22:00 4 m/s NNE 23 °C	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	D	68	57	53	48	51	45	I/A	Site Related Noise Events: Inaudible Other Noise Events: Wind related noise 42-68
		2	D	62	54	51	45	48	43	I/A	
		3	D	62	56	52	46	50	44	I/A	
		4	D	61	55	50	45	48	42	I/A	

N/M = Not Measurable

I/A = Inaudible

6 Conclusion

SLR was engaged by Whitehaven Coal Limited to conduct attended noise monitoring for the TCM in accordance with the Tarrawonga Coal Mine Noise Management Plan.

Operator attended noise monitoring was conducted at three (3) locations in order to determine the noise performance of the TCM, with compliance achieved at all locations during all time periods.

Both TCM and Boggabri Coal operations were audible during periods of the noise monitoring, with both generating similar noise levels. The total noise levels remained below the 40 dBA $L_{Aeq(15\text{minute})}$ cumulative noise criteria for all measurements.

APPENDIX A

Acoustic Terminology

Sound Level or Noise Level

The terms “sound” and “noise” are almost interchangeable, except that in common usage “noise” is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 “A” Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an “A-weighting” filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as “linear”, and the units are expressed as dB(lin) or dB.

3 Sound Power Level

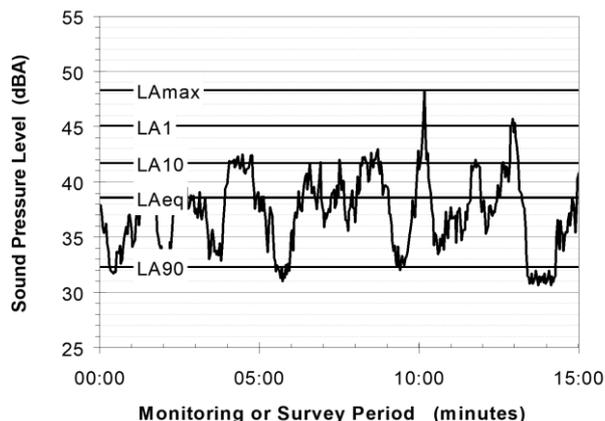
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the “repeatable minimum” LA90 noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or “average” levels representative of the other descriptors (LAeq, LA10, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than “broad band” noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

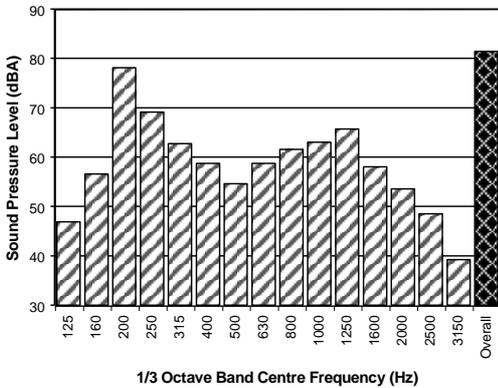
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of “peak” velocity or “rms” velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as “peak particle velocity”, or PPV. The latter incorporates “root mean squared” averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V , expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_0)$, where V_0 is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organizations.

9 Human Perception of Vibration

People are able to “feel” vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual’s perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as “normal” in a car, bus or train is considerably higher than what is perceived as “normal” in a shop, office or dwelling.

10 Over-pressure

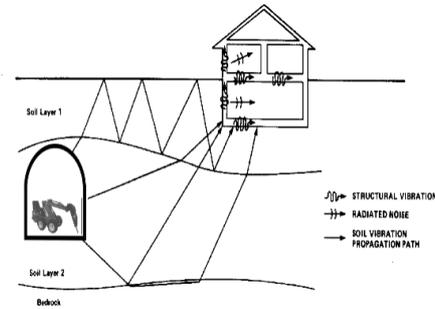
The term “over-pressure” is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed “structure-borne noise”, “ground-borne noise” or “regenerated noise”. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term “regenerated noise” is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise

APPENDIX B

Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE No.: SLM 21481 & FILT 4204

Equipment Description: Sound Level Meter

Manufacturer: B&K

Model No: 2270 **Serial No:** 3008204

Microphone Type: 4189 **Serial No:** 2983643

Filter Type: 1/3 Octave **Serial No:** 3008204

Comments: All tests passed for class 1.
(See over for details)

Owner: SLR Consulting Australia Pty Ltd
Level 2, 2 Lincoln Street
Lane Cove, NSW 2066

Ambient Pressure: 1007 hPa \pm 1.5 hPa

Temperature: 23 °C \pm 2° C **Relative Humidity:** 35% \pm 5%

Date of Calibration: 01/10/2017 **Issue Date:** 05/10/2017

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: *[Signature]* **AUTHORISED SIGNATURE:** *[Signature]*

Jack Reilly

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CERTIFICATE No.: SLM 21481 & FILT 4204

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	Clause	Result
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self Generated Noise	11.1	Entered
Electrical Noise	11.2	Entered
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	NA
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013. A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Least uncertainty for relative attenuation (at 95% c.l.) k=2:

- ±0.1 dB for attenuation equal to an less than 6 dB
- ±0.3 dB for RA from above 6 dB to 18 dB
- ±0.6 dB for RA from above 18 dB to 80 dB

Date of Calibration: 01/10/2017 **Issue Date:** 05/10/2017

Checked by: *[Signature]*

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 23292 & FILT 4791

Equipment Description: Sound & Vibration Analyser

Manufacturer: B&K

Model No: 2250 **Serial No:** 3005904

Microphone Type: 4950 **Serial No:** 2913815

Preamplifier Type: ZC0032 **Serial No:** 20518

Filter Type: 1/3 Octave **Serial No:** 3005904

Comments: All tests passed for class 1.
(See over for details)

Owner: SLR Consulting Australia Pty Ltd
Level 2, 2 Lincoln Street
Lane Cove, NSW 2066

Ambient Pressure: 990 hPa ± 1.5 hPa

Temperature: 24 °C $\pm 2^\circ$ C **Relative Humidity:** 33% $\pm 5\%$

Date of Calibration: 06/08/2018 **Issue Date:** 07/08/2018

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: *[Signature]* **AUTHORISED SIGNATURE:** *[Signature]*
Jack Kiehl

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CERTIFICATE No.: SLM 23292 & FILT 4791

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self Generated Noise</i>	11.1	Entered
<i>Electrical Noise</i>	11.2	Entered
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	NA
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.
A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Date of Calibration: 06/08/2018 **Issue Date:** 07/08/2018

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 22624 & FILT 4619

Equipment Description: Sound Level Meter

Manufacturer: B & K

Model No: 2250 **Serial No:** 3004636

Microphone Type: 4950 **Serial No:** 2913843

Filter Type: 1/3 Octave **Serial No:** 3004636

Comments: All tests passed for class 1.
(See over for details)

Owner: SLR Consulting Australia Pty Ltd
Level 2, 2 Lincoln Street
Lane Cove, NSW 2066

Ambient Pressure: 1009 hPa \pm 1.5 hPa

Temperature: 25 °C \pm 2° C **Relative Humidity:** 42% \pm 5%

Date of Calibration: 27/04/2018 **Issue Date:** 27/04/2018

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: **AUTHORISED SIGNATURE:**
Jack Kilde

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CERTIFICATE NO.: SLM 22624 & FILT 4619

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self Generated Noise</i>	11.1	Entered
<i>Electrical Noise</i>	11.2	Entered
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	N/A
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013. A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Least uncertainty for relative attenuation (at 95% c.l.) k=2:

- ±0.1 dB for attenuation equal to or less than 6 dB
- ±0.3 dB for RA from above 6 dB to 18 dB
- ±0.6 dB for RA from above 18 dB to 80 dB

Date of Calibration: 27/04/2018 **Issue Date:** 27/04/2018

Checked by: 

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APPENDIX A

Acoustic Terminology

1 Sound Level or Noise Level

The terms “sound” and “noise” are almost interchangeable, except that in common usage “noise” is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or L_p are commonly used to represent Sound Pressure Level. The symbol L_A represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2E-5 Pa.

2 “A” Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an “A-weighting” filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120 110	Heavy rock concert Grinding on steel	Extremely noisy
100 90	Loud car horn at 3 m Construction site with pneumatic hammering	Very noisy
80 70	Kerbside of busy street Loud radio or television	Loud
60 50	Department store General Office	Moderate to quiet
40 30	Inside private office Inside bedroom	Quiet to very quiet
20	Unoccupied recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as “linear”, and the units are expressed as dB(Z).

3 Sound Power Level

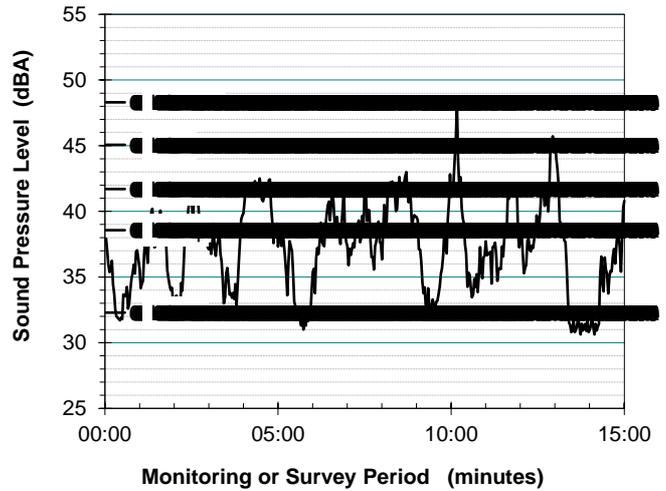
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 1E-12 W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the “repeatable minimum” LA90 noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or “average” levels representative of the other descriptors (LAeq, LA10, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than “broad band” noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

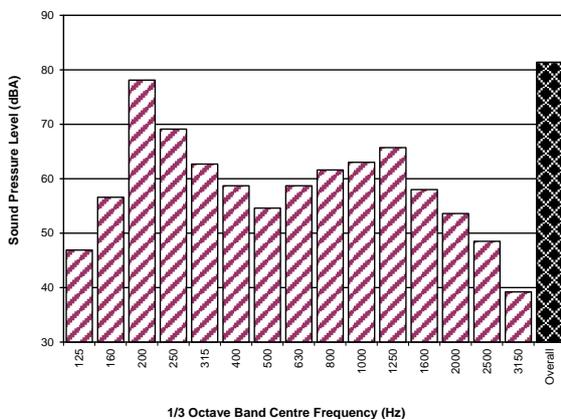
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of “peak” velocity or “rms” velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as “peak particle velocity”, or PPV. The latter incorporates “root mean squared” averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V , expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_0)$, where V_0 is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organizations.

9 Human Perception of Vibration

People are able to “feel” vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual’s perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as “normal” in a car, bus or train is considerably higher than what is perceived as “normal” in a shop, office or dwelling.

10 Over-pressure

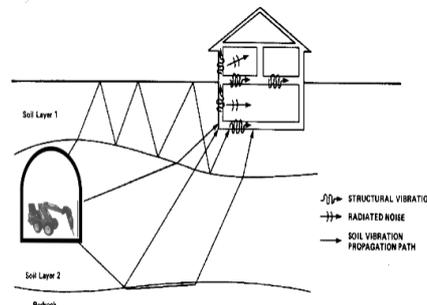
The term “over-pressure” is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed “structure-borne noise”, “ground-borne noise” or “regenerated noise”. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term “regenerated noise” is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

APPENDIX B

Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 23292 & FILT 4791

Equipment Description: Sound & Vibration Analyser

Manufacturer: B&K

Model No: 2250 **Serial No:** 3005904

Microphone Type: 4950 **Serial No:** 2913815

Preamplifier Type: ZC0032 **Serial No:** 20518

Filter Type: 1/3 Octave **Serial No:** 3005904

Comments: All tests passed for class 1.
(See over for details)

Owner: SLR Consulting Australia Pty Ltd
Level 2, 2 Lincoln Street
Lane Cove, NSW 2066

Ambient Pressure: 990 hPa ± 1.5 hPa

Temperature: 24 °C $\pm 2^\circ$ C **Relative Humidity:** 33% $\pm 5\%$

Date of Calibration: 06/08/2018 **Issue Date:** 07/08/2018

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: *[Signature]* **AUTHORISED SIGNATURE:** *[Signature]*
Jack Kiehl

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CERTIFICATE No.: SLM 23292 & FILT 4791

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self Generated Noise</i>	11.1	Entered
<i>Electrical Noise</i>	11.2	Entered
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	NA
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.
A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

1. Relative attenuation clause 5.3

Date of Calibration: 06/08/2018 **Issue Date:** 07/08/2018

Checked by: *[Signature]* Accredited for compliance with ISO/IEC 17025 - Calibration
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CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 22624 & FILT 4619

Equipment Description: Sound Level Meter

Manufacturer: B & K

Model No: 2250 **Serial No:** 3004636

Microphone Type: 4950 **Serial No:** 2913843

Filter Type: 1/3 Octave **Serial No:** 3004636

Comments: All tests passed for class 1.
(See over for details)

Owner: SLR Consulting Australia Pty Ltd
Level 2, 2 Lincoln Street
Lane Cove, NSW 2066

Ambient Pressure: 1009 hPa \pm 1.5 hPa

Temperature: 25 °C \pm 2° C **Relative Humidity:** 42% \pm 5%

Date of Calibration: 27/04/2018 **Issue Date:** 27/04/2018

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: **AUTHORISED SIGNATURE:**
Jack Kilde

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CERTIFICATE NO.: SLM 22624 & FILT 4619

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	<i>Clause</i>	<i>Result</i>
<i>Absolute Calibration</i>	10	Pass
<i>Acoustical Frequency Weighting</i>	12	Pass
<i>Self Generated Noise</i>	11.1	Entered
<i>Electrical Noise</i>	11.2	Entered
<i>Long Term Stability</i>	15	Pass
<i>Electrical Frequency Weightings</i>	13	Pass
<i>Frequency and Time Weightings</i>	14	Pass
<i>Reference Level Linearity</i>	16	Pass
<i>Range Level Linearity</i>	17	N/A
<i>Toneburst</i>	18	Pass
<i>Peak C Sound Level</i>	19	Pass
<i>Overload Indicator</i>	20	Pass
<i>High Level Stability</i>	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013. A full technical report is available if required.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 1260: 1995 and AS/NZS 4476 - 1997 and were conducted to test the following performance characteristics:

- 1. Relative attenuation clause 5.3

Least uncertainty for relative attenuation (at 95% c.l.) k=2:

- ±0.1 dB for attenuation equal to or less than 6 dB
- ±0.3 dB for RA from above 6 dB to 18 dB
- ±0.6 dB for RA from above 18 dB to 80 dB

Date of Calibration: 27/04/2018 **Issue Date:** 27/04/2018

Checked by: 

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.



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PERTH

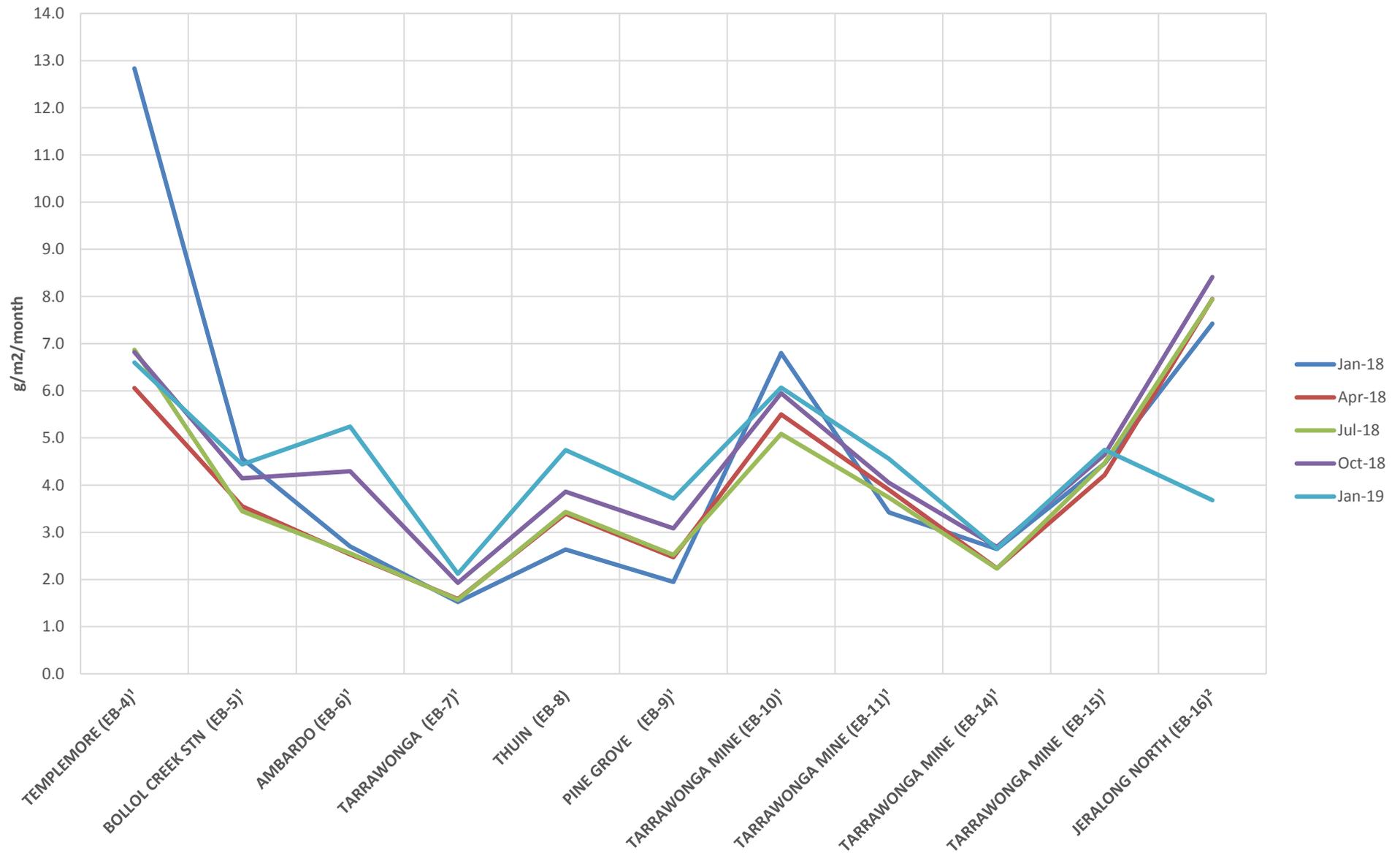
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TOWNSVILLE

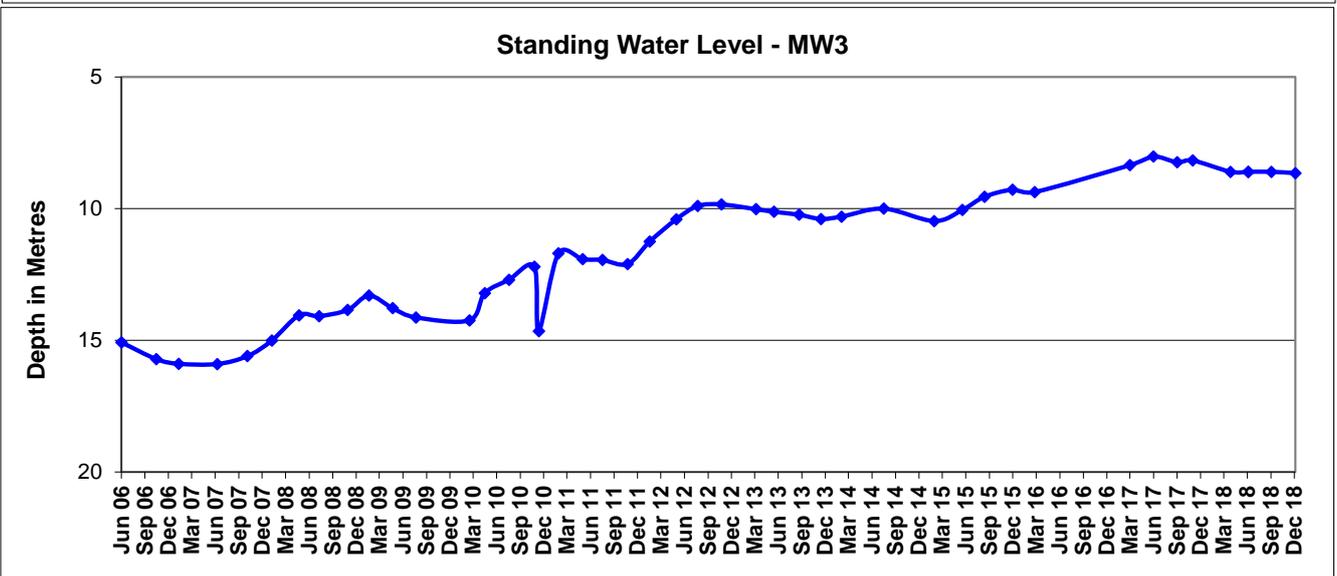
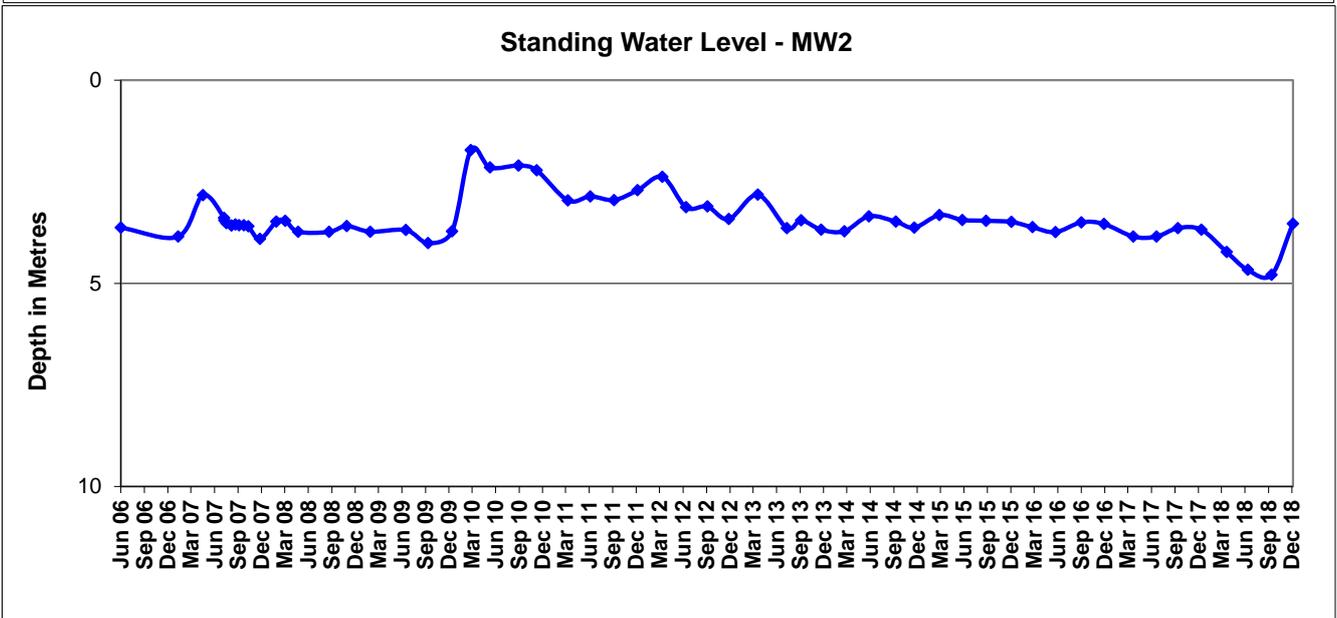
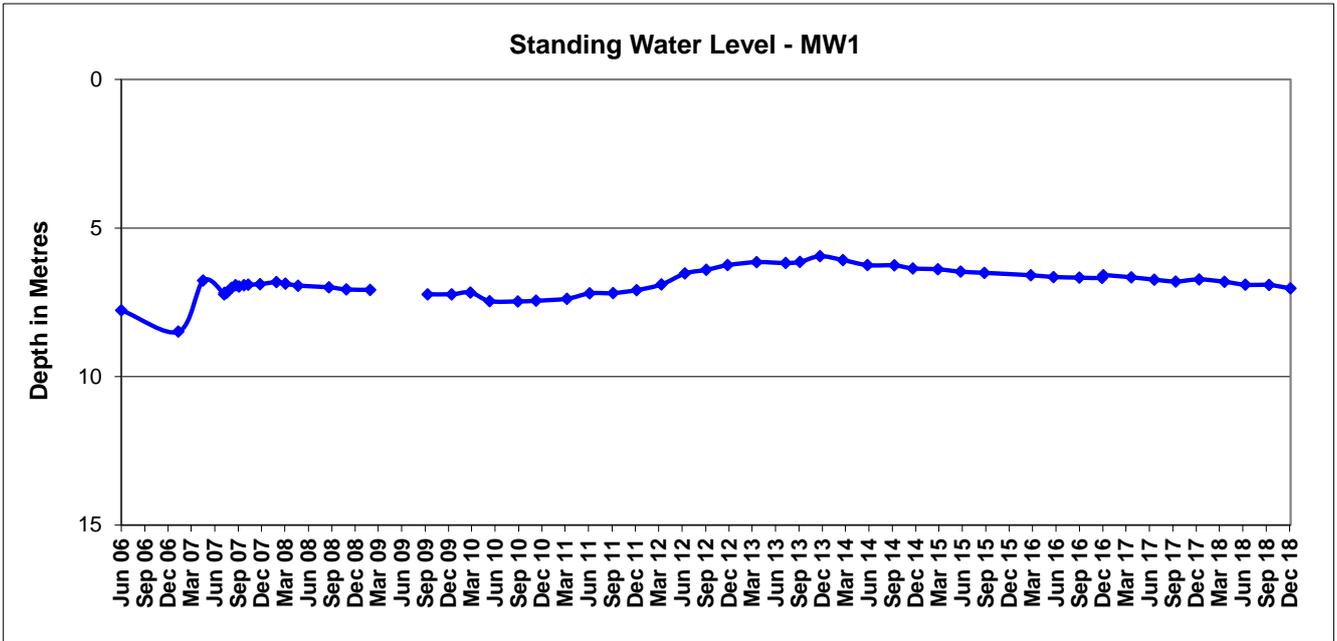
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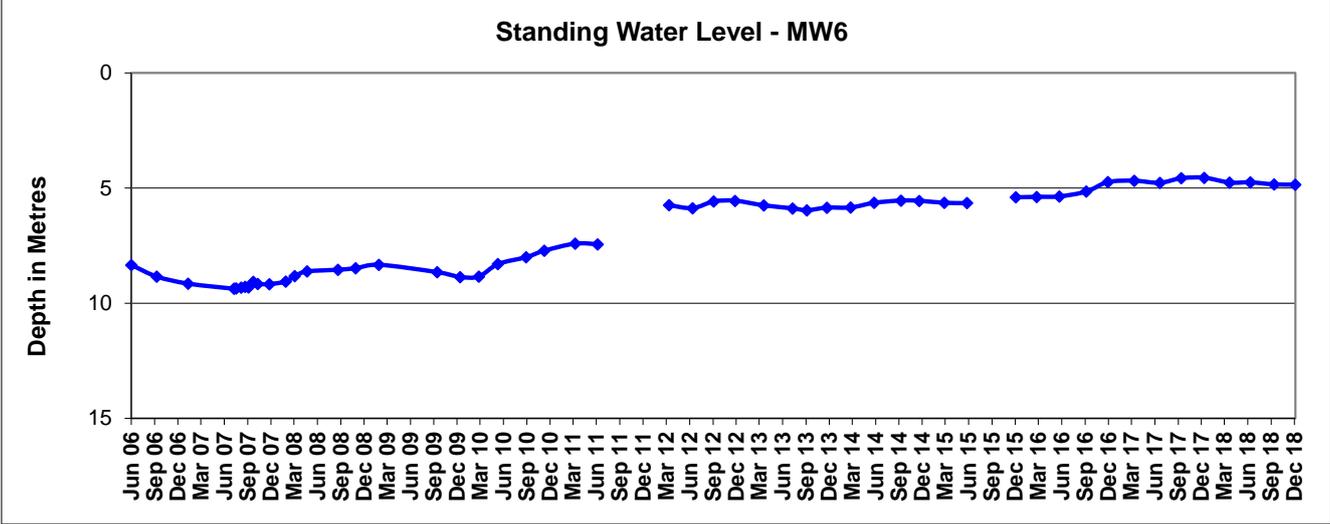
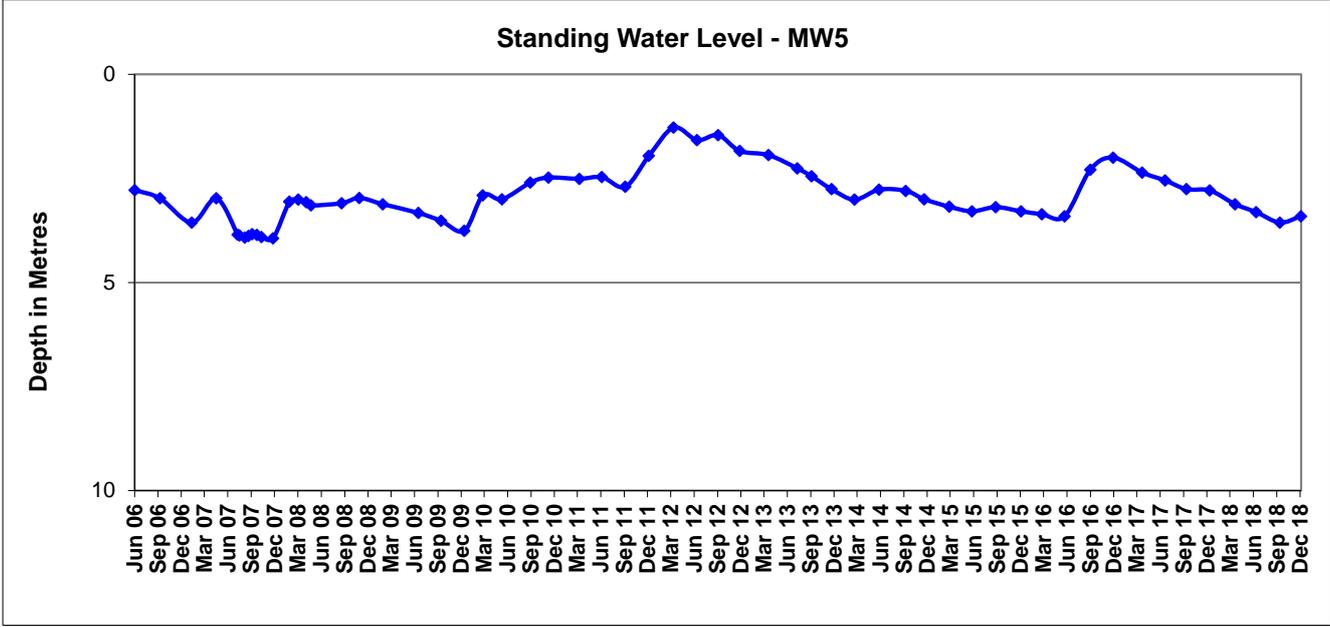
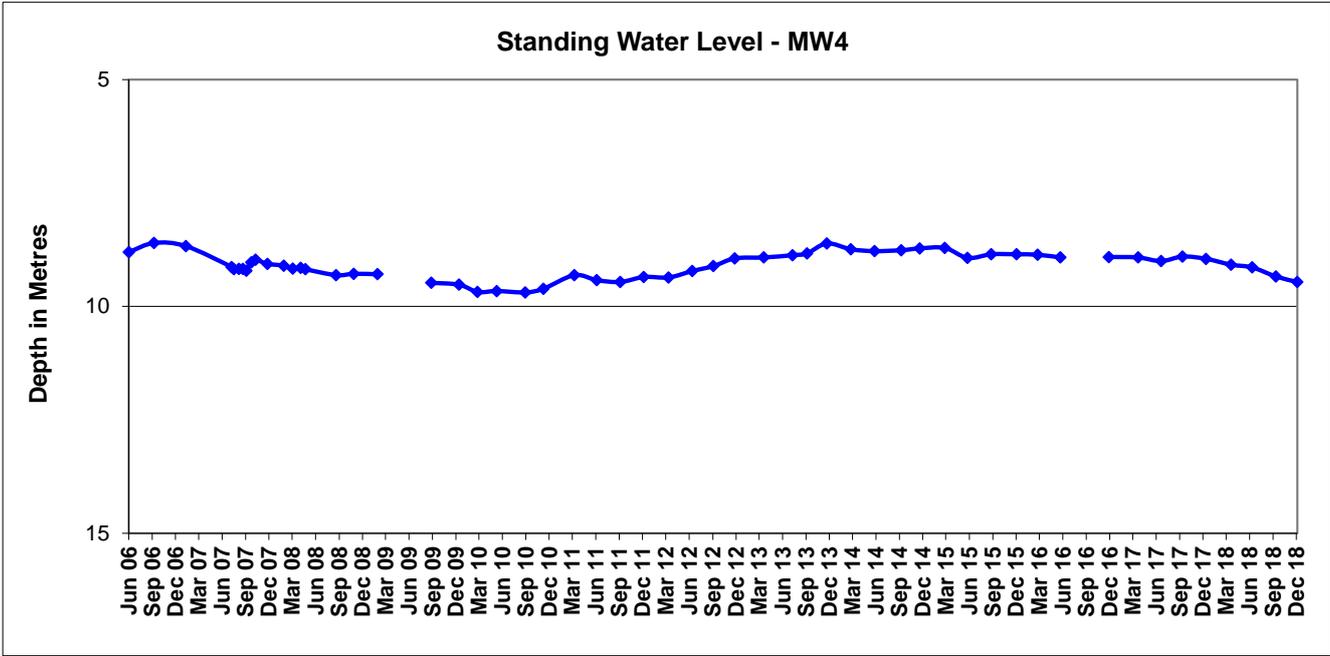
Appendix C

Deposited Dust Gauge Results- Quarterly rolling average [g/m2/month]

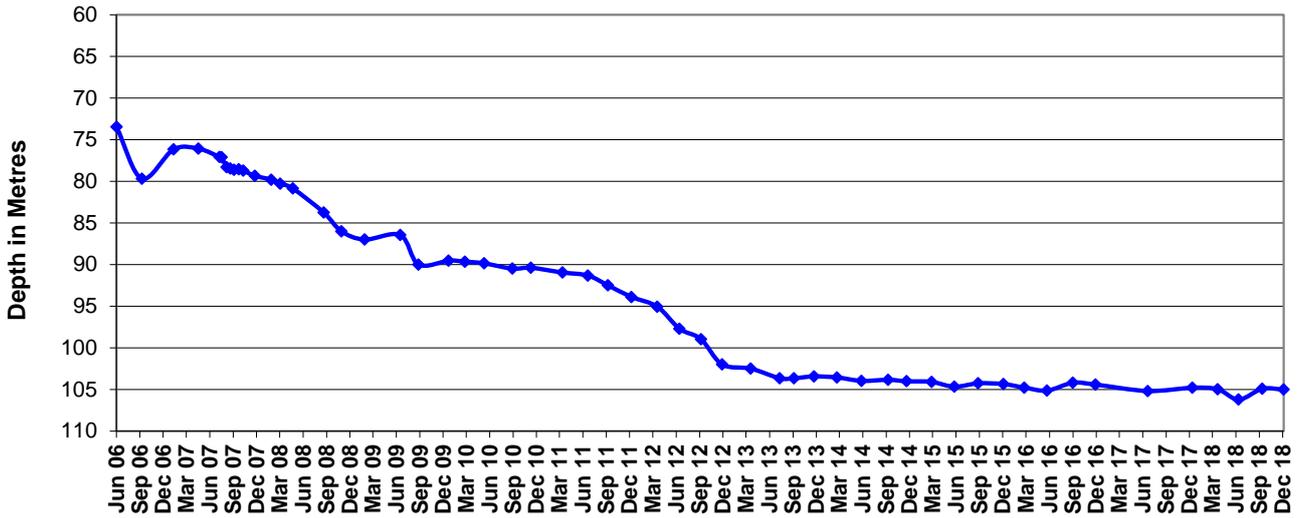


Appendix D

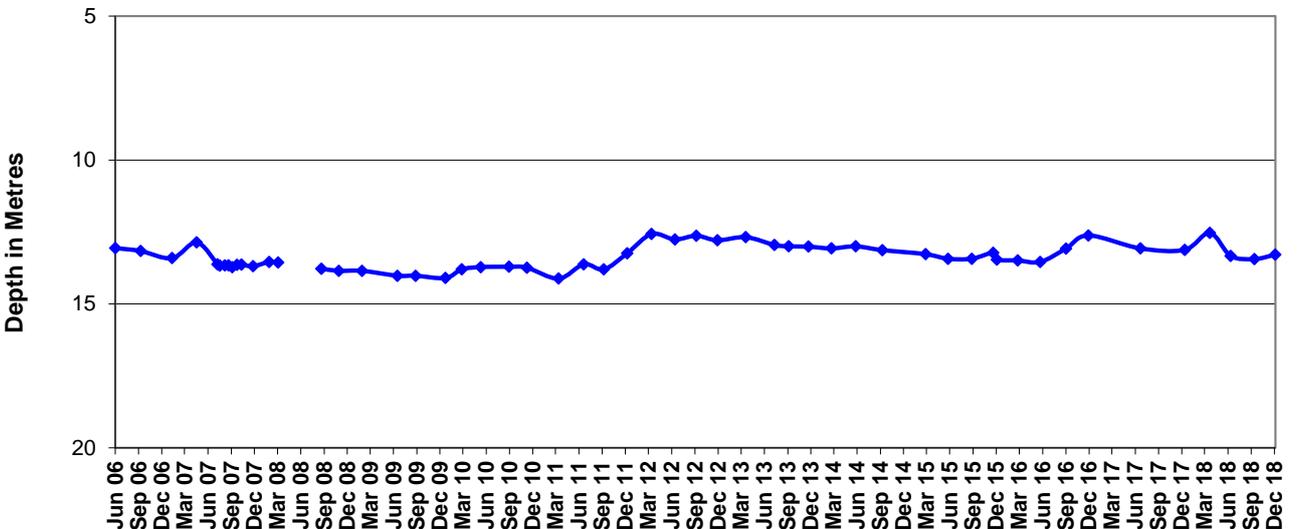




Standing Water Level - MW7



Standing Water Level - MW8



Standing Water Level - GW044997

