ANNUAL ENVIRONMENTAL MANAGEMENT REPORT - 2017

DRAYTON MINE

MALABAR COAL

Annual Environmental Management Report - 2017

Name of Operation:	Drayton Mine
Name of Operator:	MALABAR COAL (DRAYTON MANAGEMENT) PTY LTD
Development Consent/Project Approval	PA 06_0202 (as modified) and DA 106-04-00
Names of holder of Development Consent / Project Approval	MALABAR COAL (DRAYTON MANAGEMENT) PTY LTD
Titles / Mining Leases:	CL229, CL395, ML1531, A173
Names of holder of Titles / Mining Leases:	MALABAR COAL (DRAYTON MANAGEMENT) PTY LTD
Water License:	Various (see **Appendix A**)
Names of holder of Water License:	MALABAR COAL (DRAYTON MANAGEMENT) PTY LTD
MOP Commencement Date:	1st JULY 2015
MOP Completion Date:	30th JUNE 2020
AEMR Commencement Date:	1st JANUARY 2017
AEMR Completion Date:	31st DECEMBER 2017

I, Robert Hayes, certify that this audit report is a true and accurate record of the compliance status of Drayton Mine for the period 1 January 2017 to 31 December 2017 and I am authorised to make this statement on behalf of Anglo Coal (Drayton Management) Pty Ltd.

Note

a) *The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

b) *The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).*

Name of Authorised Reporting Officer:	Robert Hayes
Title of Authorised Reporting Officer:	Manager Mining Engineering
Signature of Authorised Reporting Officer:	
Date:	30/07/2018

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1 STATEMENT OF COMPLIANCE

This Annual Environmental Management Report (AEMR) provides a summary of the performance of Drayton Mine (Drayton) in the period from 1st January 2017 to 31st December 2017 (reporting period). The preparation of this AEMR has been developed to satisfy the relevant requirements of Project Approval (PA) 06_0202 (as modified), Development Application (DA) 106-04-00, Coal Lease's (CL) 229 and 395 and Mining Lease (ML) 1531.

This AEMR has been prepared in accordance with the Department of Planning and Environments (DP&E), *Annual Review Guideline 2015* and outlines any changes from the current *Drayton Mining Operations Plan* (MOP) (December 2016 amendment). The Drayton MOP covers a five year period from the 1st July 2015 to the 30th June 2020.

A review of the compliance status of the operation has been included in this AEMR against the applicable approvals (see **Section 3**) as at the end of the reporting period. **Table 1** presents a summary of compliance against key approval documentation with specific detail regarding where non-compliances have occurred during the reporting period provided in **Table 2**. Approval conditions identified as non-compliances in **Table 2** have been scaled using the *Annual Review Guideline 2015* key as reproduced in

Table 3.

Appendix A also includes a list of all key approval documents including reference to the applicable approval authority along with dates of issue and expiry.

As identified in **Table 2,** four non-compliances within the reporting period were classified as being low risk environmental non-compliances with regard to the Environment Protection Licence (EPL) and the MOP.

Table 1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
Development Consents	
PA 06_0202 (as modified)	YES
DA 106-04-00	YES
Environment Protection Licence	
EPL 1323	NO
Mining Operations Plan	
Drayton MOP (Amendment A) **(2015 – 2020)**	NO
Mining Authorisations	
CL 229	YES
CL 395	YES
ML 1531	YES
AUTH 173	YES
Groundwater Bore Licences	
Bore Licence 20BL171958	YES
Bore Licence 20BL171956	YES
Bore Licence 20BL171957	YES
Bore Licence 20BL171955	YES
Bore Licence 20BL171954	YES
Bore Licence 20BL171953	YES
Other Licences, Agreements and Approvals	
Exchange of Parts of Coal Lease 229 & Coal Lease 744	YES
Section 100 Ministerial Approval of an Emplacement Area	YES
Section 100 – ES Pit Tailings Emplacement	YES
Anglo Sub Lease (CL 225 and CL 395 Agreement with HVEC	YES

Ministerial Approval of an Emplacement Area	YES
Licence to Store Explosives (XSTR100017)	YES
Acknowledgement of Notification of Dangerous Goods on Premises **(NDG019387)**	YES
Hunter River Salinity Trading Scheme (Credit purchase arrangement)	N/A
NPWS Wildlife Refuge	YES
Bayswater/Drayton Boundary Licence No 5	YES
Licence Agreement for Liddell – Macquarie Generation Water Bores	YES
Agreement to Access & Occupy Property (Water Bores)	YES
Agreement to Access & Occupy Property (Far East Tip)	YES
Licence Agreement with Muswellbrook Pistol Club	YES

Table 2: Non-Compliances

Approval	Condition	Condition Description/Explanation	Compliance Status	Comment	Where addressed in AEMR
EPL 1323	M2.2	Continuous PM_{10} monitoring was not consistently sustained for the reporting period.	Low	PM_{10} monitoring was not completed continuously for the E-Sampler network at different stages throughout the reporting period. No mining activity took place during the period	**Section 6.2.3**
	U2.1(1)	Monitoring at the groundwater monitoring bore (DS1) on a monthly basis for the following parameters: groundwater level, electrical conductivity, pH, total dissolved solids and salinity	Low	Records for monitoring in January and February cannot be located	**Section 7.2.3**
	U2.2	Stormwater was released from the V Notch Weir for approximately nine hours after an electrical storm produced intense rainfall and a lightning strike damaged the power supply to the pump control cabinet. Approximately 56,450 litres of water with slightly elevated salinity (ranging from 5288 to 5481 µS/cm) was released.	Low	This release did not result in environmental harm and the EC readings were below naturally occurring levels previously recorded in this stream system.	**Section 7.2.3**

Approval	Condition	Condition Description/Explanation	Compliance Status	Comment	Where addressed in AEMR
Drayton MOP (Amendment A) (2015 – 2020)	Section 7.2	The rehabilitation target in 2017 was 106ha. Whilst considerable re-work of rehabilitation areas occurred in 2017, no new rehabilitation was completed.	Low	Delays in engagement of a contractor to undertake rehabilitation earthworks resulted in a delay in implementation of the rehabilitation program. No mining activity took place during the period. DRG were consulted regarding these delays and a revised MOP, which provided a revised rehabilitation schedule, was submitted for approval in September 2017. The revised MOP had not been approved at the end of the AEMR reporting period. Within 7 days of Malabar Coal taking ownership of the mine rehabilitation of the open cut recommenced	**Section 8.1**

Table 3: Compliance Status Key

Risk Level	Colour Code	Description
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-Compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur
Low	Non-Compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-Compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2 INTRODUCTION

2.1 Location and Operations

Drayton is located near the township of Muswellbrook in the Upper Hunter Valley of NSW (see **Figure A**). Drayton was in operation between 1982 and 2016, commencing coal production in 1983. Drayton was an open cut mine which used both dragline and truck and shovel with approval to produce up to eight million tonnes per annum (Mtpa) of Run of Mine (ROM) coal for export markets. Drayton ceased operation in October 2016. Consequently, during 2017 no coal was mined and there was no movement of overburden or waste rock other than for spontaneous combustion control.

Figure B presents pertinent information associated with Drayton including the authorisation boundaries, disturbance boundary, pit names and offset areas.

Landownership surrounding Drayton is presented on **Figure C**. The closest private residences are located at Antiene approximately 2.5 km north of the mine.

2.2 Ownership

For the reporting year Drayton was owned by Anglo Coal Drayton Management of which Anglo American owned an 88.2 percent share and managed the operation on behalf of Anglo Coal Drayton Management. Other joint venture partners were: Mitsui Drayton Investment Pty Limited; NCE Australia Pty Limited; Hyundai Australia Pty Limited; and Daesung Australia Limited.

Total (100%) ownership and management of the site transitioned to Malabar Coal Limited on the 26th February 2018. Malabar commenced rehabilitation activities within 7 days of taking ownership.

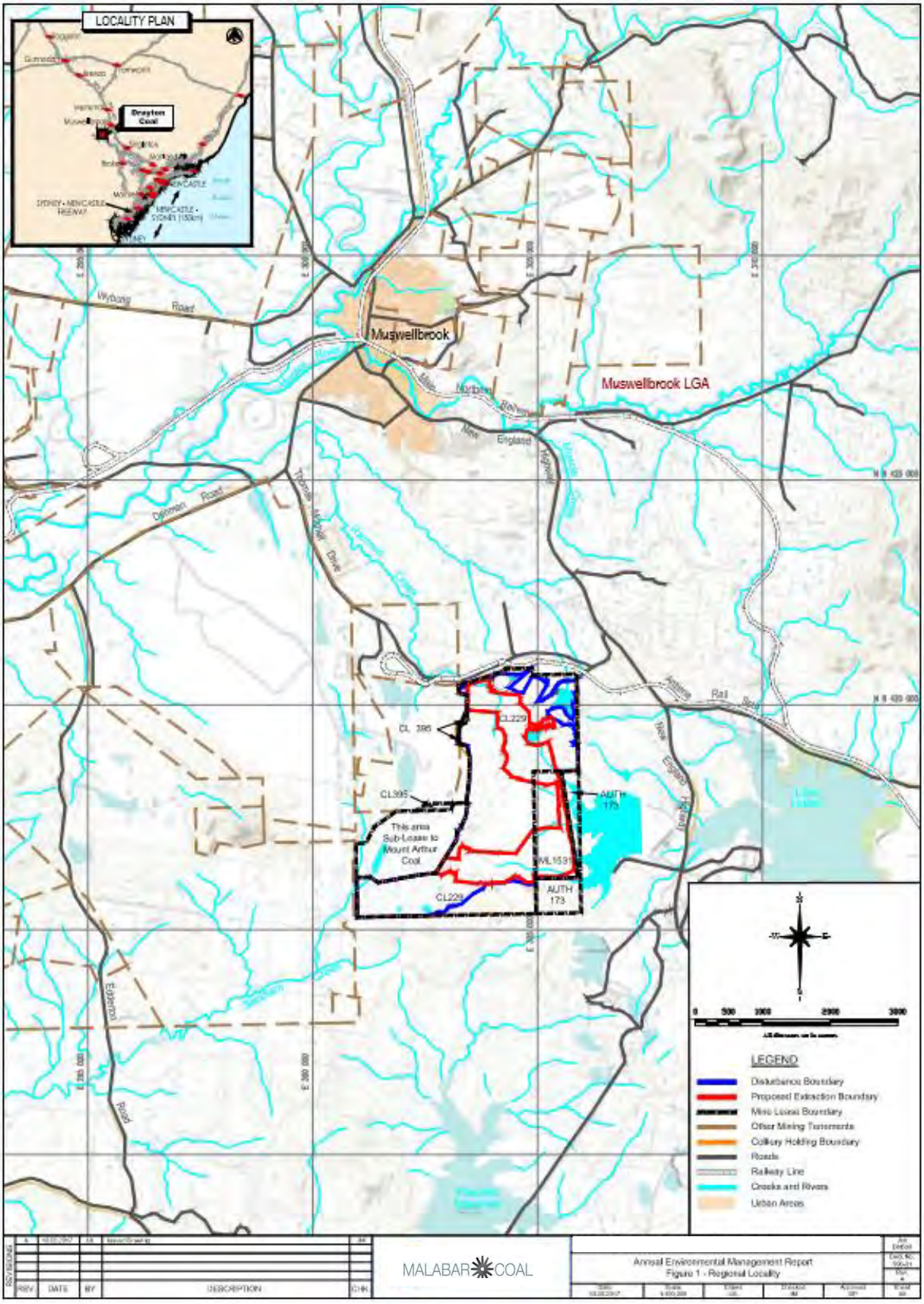


Figure A: Regional Locality

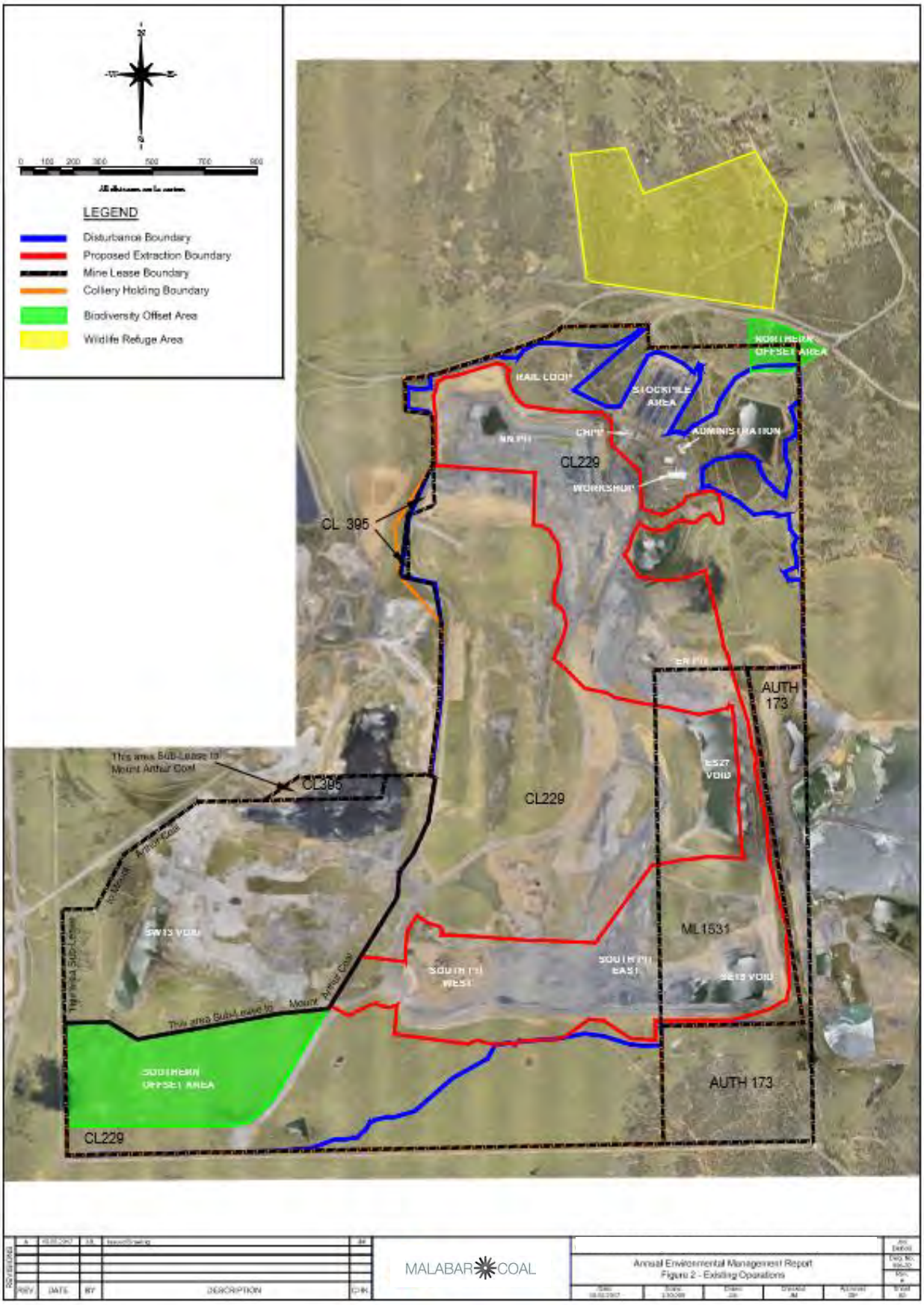


Figure B: Existing Operations

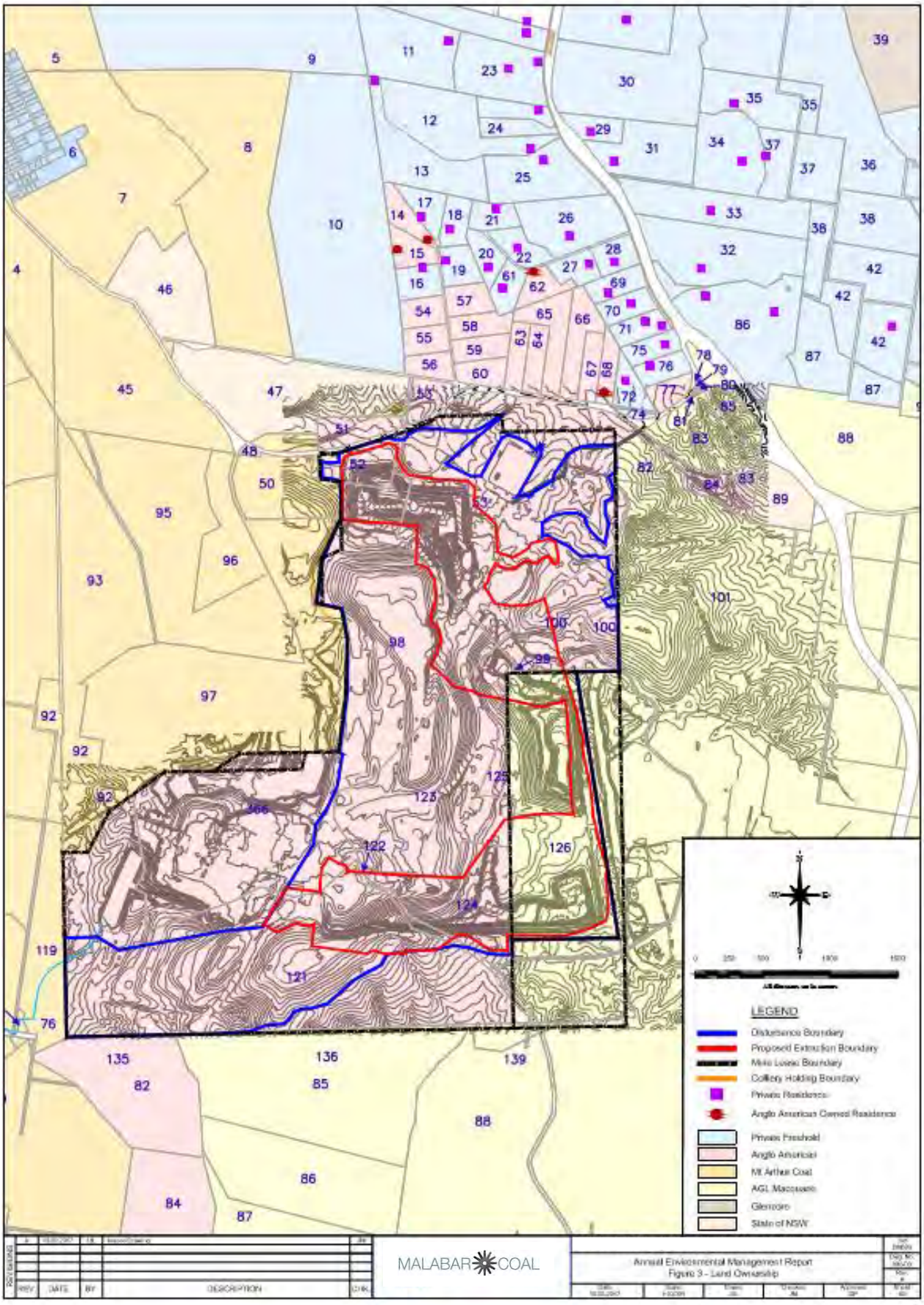


Figure C: Land Ownership

2.3 Mine Contacts

Rehabilitation of the Drayton Mine is now the primary focus of Malabar Coal. The Operations Manager and Manager Environment and Community are primarily responsible for environmental outcomes and they are supported by all remaining site personnel with additional support provided by the corporate office in Sydney.

Contact details of the Operations Manager and the Manager Environment and Community are in **Table 4** below.

Table 4: Mine Contacts

Malabar Coal Contacts	
Operations Manager	Robert Hayes (02) 6542 0203 rhayes@malabarcoal.com.au
Manager Environment & Community	Donna McLaughlin (02) 6542 0298 dmclaughlin@malabarcoal.com.au
Maxwell Infrastructure (Drayton Mine) Contacts	
Maxwell Infrastructure (Drayton Mine) Address	Thomas Mitchell Drive Muswellbrook
24 Hour Site Contact Phone Number	(02) 6542 0245
24 Hour Environmental Hotline	1800 814 195

2.4 Distribution

In accordance with conditions of PA 06_0202 (as modified) and DA 106-04-00 this AEMR will be distributed to the following agencies:

- Department of Planning and Environment (DP&E);
- Department of Planning and Environment – Division of Resources and Geoscience (DRG);
- Environment Protection Authority (EPA);
- Muswellbrook Shire Council (MSC);
- NSW Dams Safety Committee (DSC);
- NSW Department of Primary Industries – Water (DPI – Water); and
- The Drayton Community Consultative Committee (CCC).

A copy of the AEMR will also be made publicly available on the Drayton website:

http://malabarcoal.com.au/maxwell-infrastructure-downloads

3 APPROVALS

3.1 Consents, Leases and Licences

Appendix A lists Drayton's consents, approvals, leases and licenses (Approvals), with the principle approvals being:

- Project Approval (PA) 06_0202 issued on the 1st February 2008, under Section 75J of the (now repealed) Part 3A of the *Environmental Planning and Assessment Act 1979*, (EP&A Act). Modified under Section 75W in 2009 to add a further 8 ha to the existing approval area and again in 2012 for the construction of an explosive storage facility and placing tailings in the east pit.
- Development Consent (DA) 106-04-00 issued in 2000 under Section 76 (A), 9 and 80 of Part 4 of the EP&A Act authorising the Drayton mine use of the Antiene Joint Rail User Facility in conjunction with the adjoining Mt Arthur coal mine.
- Coal Lease (CL) 229 granted on the 24th June 1992 by the Minister for Mineral Resources under the *Mining Act 1973*, which was renewed in 2003 to 2nd February 2024. Mining Lease (ML) 1531 grated on 26 February 2003 by the Minister for Mineral Resources under the *Mining Act 1992.* The majority of operations occur within CL 229 and ML 1531. The additional CL 395 covers two small portions of land on the north western boundary of the mining operations.
- Section 100 and Section 101 applications, relating to an emplacement area for washery reject material, were granted in 2007 and 2011. These approvals remained in place for 2017.
- Drayton's Mining Operations Plan (MOP) was amended in December 2016 and covers the period of 1st July 2015 to 30th June 2020. The amendment to the MOP (MOP Amendment A) was subsequently approved by DRE on the 7th February 2017. As agreed with the DRE and the DP&E, the current Drayton MOP includes an approved Mine Closure Plan and Final Void Management Plan.
- Premature cessation of mining associated with rejection of the proposed open cut mining operation within EL5460 along with delays in mobilising a contractor to site to undertake rehabilitation earthworks has resulted in the deferral of the approved rehabilitation program. Representatives from NSW Department of Planning and Environment, Division of Resources and Geoscience (DRG) were consulted regarding the unanticipated delay, resulting in a submission of a second amendment (MOP Amendment B) to DRG on the 19th September 2017 seeking minor changes to accommodate:
    - the additional time required to scope, tender and establish a contractor on site to complete the earthworks activities associated with the rehabilitation of the Drayton site.
    - appropriate scheduling of the demolition of the Mining Infrastructure thereby providing these facilities to the rehabilitation contractor whilst they undertake their work;

- minor changes to; (i) seed mixes, and, (ii) conversion of some areas from pasture to native woodland vegetation to enhance the wildlife corridor and post-mining land use; and,
- a review of the proposed techniques for capping the tailings disposal area.

The MOP Amendment B was referred by DRG to DP&E for appraisal and DRG subsequently 'stopped the clock' on processing the application on the 3rd of October 2017. Drayton were advised on the 30th November 2017 that resubmission of the MOP Amendment B was required to address issues raised by DP&E, with re-submission required by the 18th December 2017. A revised version of MOP Amendment B that addressed the issues raised by DP&E was submitted to both departments on the 8th December 2017. Approval for MOP Amendment B had not been granted at the end of the reporting period.

Reporting for this period is against the currently approved MOP and as a result of the reasons listed above shows a shortfall against the targets set.

Malabar Coal is pleased to advise that it commenced rehabilitation activities within 7 days of taking ownership of the mine on 26 February 2018.

3.1.1 Mt Arthur Sublease

In 2006 Drayton Mine granted a sublease over part of CL 229 to Mt Arthur Coal (HVEC) for the deposition of overburden and tailings. The sublease was registered by DRE on 17th December 2008 and the Mt Arthur sublease area was moved from the Drayton Mine colliery holding to the HVEC colliery holding (see **Figure B**). During the 2017 reporting period, Mt Arthur Coal had full management obligations over the Sublease. Mt Arthur Coal maintains a MOP and associated rehabilitation security deposit for the Sublease area.

4 OPERATIONS SUMMARY

4.1 Exploration

No exploration activities occurred at Drayton during the reporting period.

4.2 Land Preparation

There was no additional area of land cleared for mineral extraction activities during the 2017 reporting period.

4.3 Construction

No major construction works occurred during the 2017 reporting period.

4.4 Mining

4.4.1 Coal Extraction

No coal was extracted during the reporting period. Mining statistics for 2017 are shown in **Table 5**.

The remaining resource within the currently approved mine plan footprint is approximately 4.55 Mt. The bulk of remaining reserves are located in the South Pit, West and EN Pits. A small amount remains in the NN area. The geology within these areas is complex; including multiple faults, steeply dipping coal seams and silling.

On 31st October 2016 coal extraction ceased on the site (see **Table 5**). Approvals for coal extraction ceased at the end of 2017.

4.4.2 Overburden Handling

Overburden handling during the reporting period was limited to minor movements in accordance with Drayton's Spontaneous Combustion Management Plan.

Table 5: Production Summary (Extraction)

	Approved Limit	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Waste Rock / Overburden (Mbcm)	49.42 pa (Drayton EA 2007)	15.473	0	0*
ROM Coal (Mt)	8.0 pa (PA 06_0202)	1.797	0	0
Coarse Reject (t)	950,000 (Drayton EA 2007)	350,257	0	0
Fine Reject / Tailings (t)		131,511	0	0
Product (saleable) (Mt)	7.0 pa (DA 106-04-00)**	1.361	0	0

** Consistent with Drayton MOP and excludes reshape and rehandle associated with rehabilitation activities proposed.*
***Associated with coal transported on the Drayton Rail Loop.*

4.4.3 ROM Production History and Forecast

There was no ROM coal production or prime waste removal during the reporting period. A comparison showing the ROM production at Drayton for the past reporting periods is provided in **Table 6**.

No prime waste removal or coal extraction at Drayton is anticipated in the next reporting period.

Table 6: History of ROM Coal Production

Year	Production (Mt)	Year	Production (Mt)
1985	1	**2002**	4.84
1986	2	**2003**	5.04
1987	3	**2004**	4.98
1988	3	**2005**	4.73
1989	3.55	**2006**	5.021
1990	3.48	**2007**	4.691
1991	3.96	**2008**	4.171
1992	3.85	**2009**	4.821
1993	3.97	**2010**	5.425
1994	3.77	**2011**	5.312
1995	3.85	**2012**	5.456
1996	3.5	**2013**	5.488
1997	4.2	**2014**	4.758
1998	4.5	**2015**	3.1
1999	4.8	**2016**	1.8
2000	5.07	**2017**	0
2001	5.23	**2018**	-

4.4.4 Changes in Mining Equipment and Method

During 2017, the majority of Drayton mining fleet was sold; however, Drayton utilised a variety of contract equipment on an as required basis to support necessary activities across the site.

During the 2017 reporting period the following equipment was utilised:

- One D11R track dozer for tasks including; spontaneous combustion related remedial works, access road maintenance and support for the relocation of the dragline to the Mt Arthur lease area.
- A 14 class grader for road maintenance.
- A 40-tonne articulated haul truck for haulage of sediment from several dams to the north pit and to relocate soil from the bioremediation cells.
- A 30 tonne excavator for tasks including removal of sediment from dams and cultivation of the bioremediation cells.
- A long reach excavator for removal of sediment from dams.
- A D6 track dozer for cultivation of slopes prior to seeding, for seeding operations, for road maintenance and for spontaneous combustion related remedial works.
- A small excavator for repair of contour drains and to scarify the crests of contour drains prior to seeding. This excavator was also utilised for spontaneous combustion related remedial works.

The Drayton dragline was walked offsite to the Mt Arthur lease in December 2017.

At the end of the reporting period only the D-11 track dozer remained on site.

4.5 Mineral Processing and Transportation

No mineral processing was undertaken through the Drayton Coal Handling Plant (CHP) during the reporting period. The plant has been placed under a care and maintenance regime.

Associated with the completion of coal extraction the remaining product coal was transported from the Drayton load out facility on 9 November 2016.

During the reporting period no tailings were deposited into the ES void.

4.6 ROM & Product Coal Handling

Consistent with cessation of mining the CHP stockpiles have been emptied and the associated equipment placed on care and maintenance.

4.6.1 Antiene Joint Rail User Facility

The Antiene Rail Spur is wholly owned and operated by Drayton Mine in accordance with DA 106-04-00. DA 106-04-00 was obtained in November 2000 to increase the authorised tonnage of the Drayton Loop to 7 Mtpa and the Antiene Spur to 20 Mtpa. During the reporting period no coal was transported on the Drayton Rail Loop.

DA 106-04-00 permits up to a combined total of 20 Mtpa coal and up to 30 train movements per day on the Antiene Rail Spur, per the condition below:

> *6.1 Limits on Transportation of Coal*
>
> *(b) Coal transported along the Antiene Rail Spur is limited to twenty (20) million tonnes per annum;*
>
> *(d) The peak number of train movements along the Antiene Rail Spur are limited to 30 per day.*

There were no variations to Drayton approvals relating to the rail facility during the 2017 reporting period.

Additionally, condition 8.1 of DA 106-04-00 requires that the following additional information be supplied in relation to environmental management of the Drayton Rail Loop and Antiene Rail Spur development.

4.6.2 Antiene Joint Rail Management

Dust mitigation measures were proposed in the EA for both the construction and operation of the Bayswater Rail Loading Facility (Mt Arthur Coal) and operation of the Antiene Joint User Rail Facility. Mitigation measures included enclosing conveyors, loading trains using a telescopic chute, utilising train carriages designed with small aperture and equipping transfer points with dust suppression structures.

In addition to the dust mitigation measures, which can assist with noise abatement, noise barricades were constructed at the northern face at the base of the rail loadout bins. During the 2017 reporting period, there were no noise related complaints made in regards to rail activity (see **Section 9.2**).

Offsite lighting is restricted on the rail loader and rail loop. The lighting is similar to street lighting and was predicted to have minimal impacts on neighbours or motorists using Thomas Mitchell Drive. A dense surrounding of native trees is in place to mitigate the impacts on the surrounding residents. In 2017 no complaints were made in regards to lighting.

The joint Drayton and Mt Arthur Coal CCC held two scheduled meetings during 2017 where the environmental performance of the rail spur was reviewed and discussed along with any other issues associated with the operation of the facility.

Environmental targets and strategies are detailed in Drayton's Environment Management Plans (EMP) and include:

- Adhere to all conditions as set out in development consent;
- Ensure all monitoring is undertaken per EMP and consent conditions;
- Ensure all enquiries are dealt with promptly and efficiently;
- Ensure all reporting requirements are met within the required timeframe;
- Ensure, if required, that any requirements outside of this consent, as directed by the Director General are undertaken; and
- Ensure active community consultation continues on a regular basis.

4.6.3 Antiene Joint Rail Monitoring

Condition 6.1(a) and (b) states that Coal transported along the Antiene Rail Spur is limited to twenty (20) million tonnes per annum of which Drayton is approved to rail seven (7) million tonnes per annum. In the 2017 reporting period, 16,792,865 t of coal was transported on the Antiene Rail Spur. This comprised of 0 t from Drayton and 16,792,865 t from Mt Arthur Coal and remained below the maximum levels described in DA 106-04-00. It should be noted that Mt Arthur Coal has a more recent development approval allowing up to 27 Mt of coal to be transported annually along the Antiene Rail Spur.

General environmental monitoring also continued throughout 2017 with regards to both Drayton mine and the Drayton Rail Loop Facility. Impacts to water quality within the Rail Loading Facility and the Rail Spur have been minimal. A significant program of works was undertaken in May 2017 to remove coal fines and sediment from the Rail Loop Dam and adjoining sediment collection sumps.

The EA predicted only low level air quality impacts as a result of the construction of the Bayswater Rail Loading Facility and operation of the Antiene Joint User Rail Facility. As predicted, no significant amounts of dust have been observed from the rail loop or spur.

Noise assessments indicated that there would not be a significant noise impact from these areas provided that appropriate noise abatement measures were adopted. Noise monitoring undertaken whilst the Rail Loading Facility and Rail Spur has supported these assessments (see **Section 6.9**).

4.7 Hours of Operation

During the 2017 reporting period site activities were conducted up to 12 hours per day, five days per week.

It is anticipated that during the next reporting period operations will initially be conducted up to 12 hours per day, five days per week. The option of transitioning to a 24 hour per day, six days a week work pattern may be considered to support the planned rehabilitation activities in 2018.

4.8 Forecast Activities for the Next Reporting Period

It is anticipated that during the next reporting period site activity will focus on the final landform development, rehabilitation and environmental monitoring.

5 ACTIONS REQUIRED FROM PREVIOUS AEMR REVIEW

The 2016 AEMR was provided to the DP&E, DRG, EPA, MSC and DSC for review and comment. A response was provided from DP&E in correspondence dated 24th May 2017. These comments, associated actions and how they have been addressed are presented in **Table 7**. Acceptance of the AEMR was received from NSW Department of Planning and Environment, Division of Resources and Geoscience (DRG) in a letter dated 13th July 2017.

Table 7: Actions from the previous AEMR

Department / Action Number	Action Required from previous AEMR	Due Date specified in correspondence.	Response from Drayton
DP&E 24th May 2017			
DP&E / a)	Outstanding actions from previous AEMR Review – The Departments letter of 31 May 2016 requested that future AEMR's be prepared as per the Annual Review Guideline 2015. The Department's review of the 2016 AEMR notes that this has generally occurred with the exception of the Statement of Compliance. Please update the Table 1 Statement of Compliance to include all of the consents, lease and licences listed in Appendix A Table 36 of the 2016 AEMR.	19 June 2017	An amended 2016 AEMR was prepared and distributed with Table 1 updated, as required.
DP&E / b)	Outstanding actions from previous 2015 Independent Environmental Audit (IEA) and Response to Auditors Recommendations (RAR) – The RAR recommended a number of management plans be updated resulting from the IEA. In a letter dated 31 May 2016 Drayton Coal made a commitment to update the following management plans by 31 August 2016; i). Blasting Management and Monitoring Plan ii). Air Quality Management and Monitoring Plan iii). Water Management Plan iv). Aboriginal Cultural Heritage Management Plan. v). Environmental Management Strategy vi). Environmental Monitoring Program It is noted that the Department has not received updated versions of the above Management Plans and has subsequently not approved these plans. The Department requests under Sch.2 Condition 4 of the Project Approval 06_0202 that the above management plans, strategy and program be submitted for review no later than 19 June 2017. Failure to submit these plans may result in further compliance action.	19 June 2017	The listed plans were updated and resubmitted to the department for approval on 19 June 2017. The department approved the updated plans 18 September 2017.

Department / Action Number	Action Required from previous AEMR	Due Date specified in correspondence.	Response from Drayton
DP&E / c)	Rehabilitation and Offset Management – The Department requests that further information is provided in accordance with Schedule 5, Condition 5(f), in order to understand the current progress and status of rehabilitation and offset areas, including • Detail the objectives, performance metrics and monitoring results to assess the outcome of the current trials (e.g. hydro mulching of highwall, horse grazing and use of organic waste trials). • Quantify the short, medium and long term completion criteria, for each final landuse. • Identify how the completion criteria relate to the monitoring undertaken at the analogue sites. • Identify the performance objectives and completion criteria identified in the Offset Strategy, Rehabilitation and Offset Management Plan and Flora and Fauna Management Plan. • Provide comparison of the performance metrics/targets identified above with the monitoring undertaken within the rehabilitation and offset management areas. Including the presentation of data in tables and graphs, and the inclusion of ecological monitoring data as an appendix to the AEMR. • Provide a discussion of the rehabilitation and offset management areas performance (i.e. trends, relative tracking against performance metrics/targets, trigger points when action will be taken due to poor performance, actions to be undertaken to address adverse results [the Department notes that some areas are underperforming and requests further advice as to how this is being addressed], rehabilitation phase [e.g. earthworks, growth medium establishment, initial planting etc], indicative timeframe to progress to next phase etc). • Discussion of the above within the context of the nominated final landuse for each area. • In 2015 a large area of tubestock plantings failed within areas of rehabilitation at the Drayton site. Drayton have committed to undertaking an investigation into the high rate of tubestock failure that has occurred since 2015. The Department requests that the outcome of this investigation, together with the corresponding action plan be provided to the Department by 10 July 2017	10 July 2017	Information addressing these points was provided to the department in correspondence dated 10 July 2017

Department / Action Number	Action Required from previous AEMR	Due Date specified in correspondence.	Response from Drayton
DP&E	Furthermore, the Department requests under Sch.2 Condition 4 of the Project Approval 06_0202 that the bond as required by Schedule 3, Condition 42, be reviewed and submitted to the Secretary of the Department of Planning and Environment by 30 September 2017. The Department will review this bond and supporting documents to determine satisfaction with the requirement of the condition.	30 September 2017	A revised bond calculation was submitted to the department for review on 26 September 2017. The Department has since engaged with Drayton to refine this calculation.

6 ENVIRONMENTAL PERFORMANCE

Environmental monitoring is an integral component of Drayton's operation. Monitoring undertaken includes air quality, surface and ground water quality, blasting, noise and meteorology. All monitoring is conducted in accordance with the appropriate Australian Standard, with collection of samples by site personnel or contractors and the analysis of water and dust samples performed by an independent laboratory that is NATA accredited.

The following section reports on the environmental performance associated with Drayton Mine during the reporting period.

6.1 Meteorological Monitoring

6.1.1 Introduction

Real-time meteorological monitoring is a component of Drayton's environmental monitoring system. Meteorological data including wind speed, wind direction, temperature, rainfall, solar radiation and humidity are monitored using an on-site automatic weather station located at the CHP.

The data is collected at five-minute intervals and transferred directly into a log file located on Drayton's electronic database. The data allows Drayton employees to assess the prevailing weather conditions and modify the operation where necessary to suit the current conditions. It also played a vital role in planning blasting events for appropriate weather conditions when the mine was operating.

Prevailing winds at Drayton historically depict winds from the south-east in summer months and the north-west during winter months which influences the potential impacts that operations at Drayton Mine have on air quality results.

6.1.2 Results

Rainfall

Total annual rainfall for 2017 was 530.6 mm falling over 115 rain days, a decrease from the previous reporting period (759.6 mm) and well below the long-term average of 673.5 mm. March was the wettest month during 2017 with 225.4 mm of rain. This result was the highest recorded rainfall for March since records began in 1981. July was the driest since 1981 with 4.2 mm of rain recorded (see **Figure D**). **Figure D** contains the monthly averages for the entirety of 2017 and compares this with historical rainfall data.

The total monthly rainfall and the total number of rain days during the 2017 reporting period are shown in **Table 8**. There was an increase in the total number of rain days experienced in 2017 with 115 compared to 110 in 2016 however the rainfall totals were significantly below average for the year with only March and October experiencing above average rainfall.

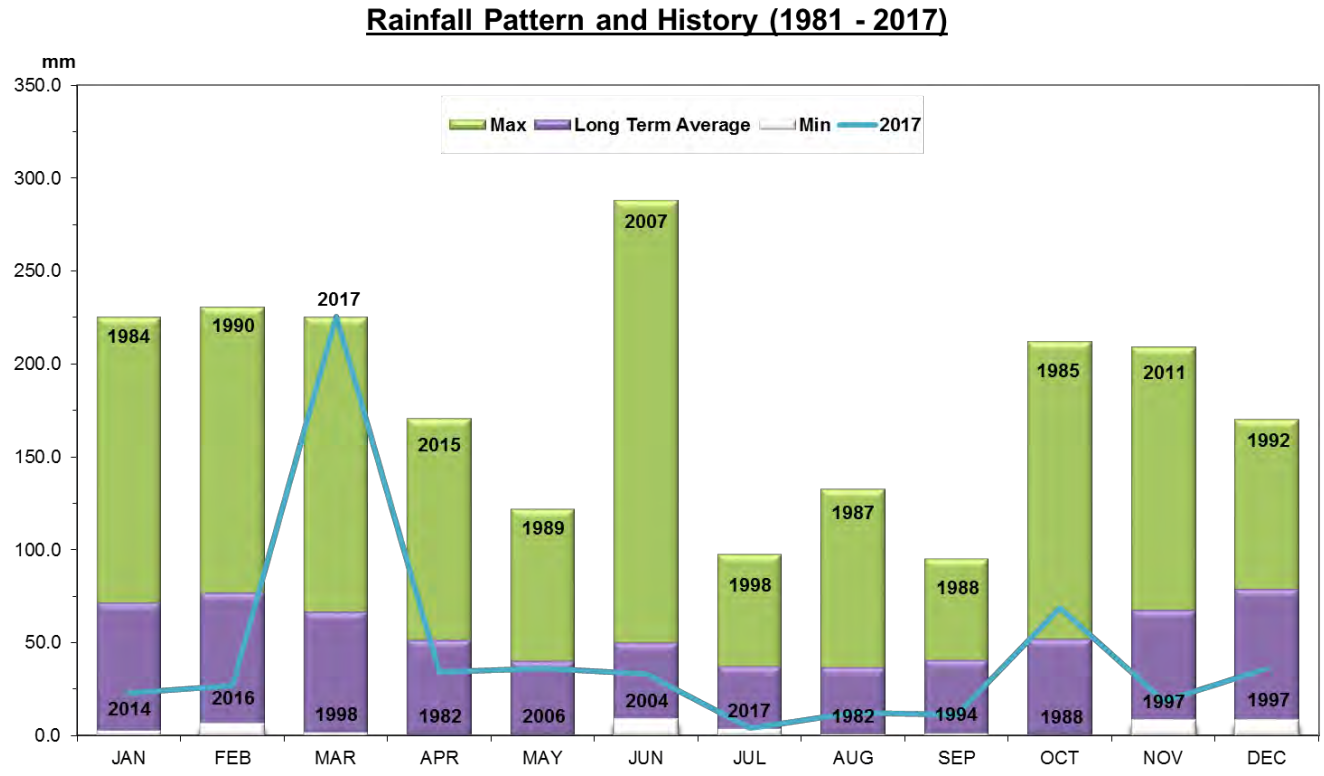


Figure D: Rainfall history 1981 to 2017

Table 8: Total Monthly Rainfall for 2017

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rainfall (mm)	23	27	225.4	34.4	36	33.2	4.2	12.4	11.4	68.6	18.8	36.2	**530.6**
No. of rain days	10	12	18	13	9	16	5	1	2	11	7	11	**115**

Note: A rain day is a day in which 0.2 mm or greater of water is recorded by the on-site meteorological station

Temperature

Ambient temperature was monitored at the Drayton CHP meteorological station. The maximum temperature recorded during the year was 47.6°C on the 11th of February 2017 and the minimum was -0.1°C on 2nd of July 2017. Temperatures in 2017 followed a similar trend to 2016; however, 2017 experienced generally warmer maximum temperatures than 2016. The temperature range per month throughout 2017 and a comparison of the 2016 and 2017 average temperatures is shown in **Table 9** below.

Table 9: 2017 Monthly Temperature Range and Average Daily Temperature

Month	Monthly Temp Range 2017 (°C)	Average Daily Temp 2017 (°C)	Average Daily Temp 2016 (°C)
January	15.8 – 42.7	26.3	23.4
February	11.7 – 47.6	26.1	24.6
March	11.8 – 34.5	21.8	23.1
April	6.1 – 27.0	16.7	20.9
May	1.5 – 25.6	14.1	16.1
June	1.7 – 19.6	11.9	12.3
July	-0.1 – 24.5	10.7	11.9
August	0.8 – 26.9	12.5	12.4
September	1.5 – 35.2	16.7	15.0
October	7.4 – 36.1	19.6	17.1
November	9.3 – 33.4	19.5	22.1
December	13.7 – 42.4	25.0	25.5

Wind Speed and Direction

Similar to previous years, the prominent wind directions at Drayton during 2017 were north westerly to south easterly.

6.2 Air Quality

6.2.1 Introduction

Specific requirements and criteria relating to air quality monitoring are detailed in PA 06_0202 and EPL 1323. The Drayton air quality monitoring program assesses possible impacts against required parameters including Depositional Dust, Total Suspended Particulates (TSP) and particulate matter less than 10 µm in diameter (PM_{10}).

A component of the air quality monitoring network includes the dust management system where upwind and downwind real time monitors provide feedback to a software package that assesses Drayton's dust contribution. This system provides alerts when Drayton's dust emissions are elevated which triggers actions for employees. This has been outlined in Drayton's Air Quality Management and Monitoring Plan.

6.2.2 Monitoring System

Throughout the 2017 reporting period air quality monitoring continued on the existing network of monitoring locations. A combination of dust fallout gauges, high volumes air samplers and real time monitoring stations currently monitor dust levels in areas surrounding the Drayton operation. Air quality monitoring focuses on the northern areas of Drayton as these are the nearest privately-owned lands not used for heavy industry. On the western side of Drayton is the Mt Arthur open cut coal mine and to the east and south are AGL Macquarie's Liddell and Bayswater power stations and ash dams.

Using the results from the monitoring program, Drayton is able to determine compliance with applicable licence conditions. The results from the Drayton air quality monitoring program were published monthly via the Anglo American website and reported annually in this AEMR. Following transition of the site to Malabar Coal on the 26th February 2017 the information will be published on the Malabar Coal website.

Drayton also considers regional air quality via the Upper Hunter Air Quality Monitoring Network (UHAQMN) monitoring network for PM_{10} and $PM_{2.5}$. SMS notification is provided to site environment personnel when elevated dust levels are recorded and predicted dust risk was provided daily via email notification. Alerts are also generated from the UHAQMN when regional air quality deteriorates.

6.2.3 Monitoring Results

Deposited Dust

Dust depositional gauges have been in operation for the life of the mine. The eight depositional gauges used for compliance are situated to the north of the lease boundary, and in the vicinity of the residential areas around the mine (see **Figure E**).

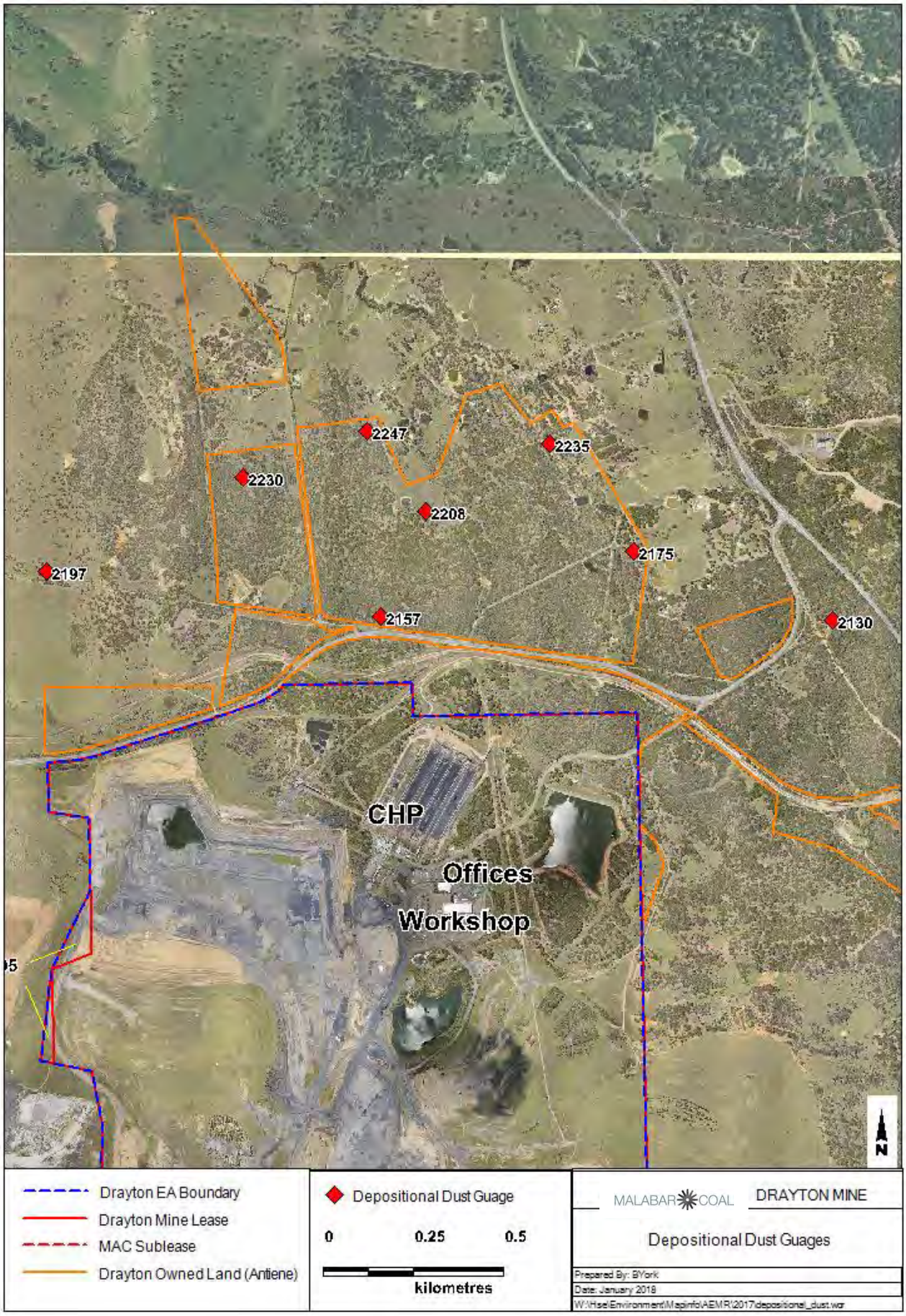


Figure E: Depositional Dust Monitoring Sites

The dust gauges and measurement conform to *AS3580.10.1 - 2003 - Methods 10.1 - Determination of Particulates - Deposited matter - Gravimetric Method*. Samples are collected, in accordance with AS 2724.5 (1987) each calendar month. The samples are analysed by a NATA certified laboratory for total solids, insoluble solids, ash residue and combustible matter. A field observation is made during collection as to possible contamination of samples. To determine compliance the depositional dust results are compared to impact assessment criteria identified in PA 06_0202 and outlined in

Table 10.

There were no exceedances of the depositional dust impact assessment criteria recorded during the reporting period.

The Drayton Mine Extension Environmental Assessment 2007 estimated emissions to air for years one, five and ten, and modelled the dispersion and deposition of emissions in these years. The 2017 reporting period coincides with year ten of the EA therefore the 2017 results have been compared to that year's prediction.

The 2007 EA predicted that no privately-owned residences would experience dust deposition levels above the assessment criteria during Year 10. The 2017 dust deposition levels displayed slightly higher than modelling predictions; however, all results remain well below the 4 g/m^2/month annual average as identified in PA 06_0202 and outlined in

Table 10. Monitoring results compared to those predicted in the EA can be found in **Table 11. Table 12** and **Figure F** summarise the year's results of insoluble solids, ash and combustible matter recorded during 2017.

All dust gauges, except 2235, were equal to or below the long term averages (see **Table 12**). In 2017 the overall average level of insoluble solids across all eight gauges from all sources was 2.0 g/m²/month. This was a decrease of 0.1 g/m²/month compared to the 2016 average insoluble solids level of 2.1 g/m²/month. Details relating to each individual gauge on a monthly basis are outlined in **Appendix C**.

Gauge 2235 had the highest average result level for 2017. This gauge was influenced by a potentially contaminated sample in January 2017. The field sheet notes that the lid was broken and required replacement. The January result was included for the purpose of reporting. Had it been excluded, the average for gauge 2235 would have been 2.0 g/m^2/month, equal to the 2016 average and only marginally higher than the long term average of 1.9 g/m^2/month.

Due to the nature of deposition dust gauges, contamination of samples by bird droppings, insects and vegetation does occur from time to time. Contamination may cause dust results to appear higher than they actually are.

Table 10: Long Term Impact Assessment Criteria for Deposited Dust

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Levels	Maximum Total Deposited Dust Level
Deposited Dust	Annual	2 g/m²/month	4 g/m²/month

Table 11: 2017 Dust Deposition Results Compared with EA Predictions

Residence ID	Representative Dust Gauge	2017 Average Insoluble Solids (g/m²/month)	EA Prediction Year 10 Average Insoluble Solids (g/m²/month)
16	2235	2.4	1.5
61	2247	1.9	1.4
27	2230	2.2	1.3
71	2175	1.8	1.3

Table 12: 2017 Average Dust Deposition Gauge Results

Site Number	Ash (g/m²/month)	Combustible Matter (g/m²/month)	Insoluble Solids (g/m²/month)	No of Samples 2017	Limit (Insoluble Solids)	Long Term Average (Insoluble Solids)	
					g/m²/month	g/m²/month	Period
2197	1.5	0.8	2.3	12	4.0	3.2	2001 – 2017
2230	1.4	0.8	2.2	12	4.0	2.2	2001 - 2017
2157	1.2	0.6	1.8	12	4.0	1.9	2001 - 2017
2208	1.2	0.5	1.6	12	4.0	1.7	2001 - 2017
2247	1.3	0.6	1.9	12	4.0	1.9	2001 - 2017
2235	1.5	0.9	2.4	12	4.0	1.9	2001 - 2017
2175	1.2	0.6	1.8	12	4.0	1.9	2001 - 2017
2130	1.2	0.6	1.8	12	4.0	2.1	2001 - 2017

Note: Deposited dust is assessed as insoluble solids as defined by 'AS/NZS 3580.10.1.2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method'.

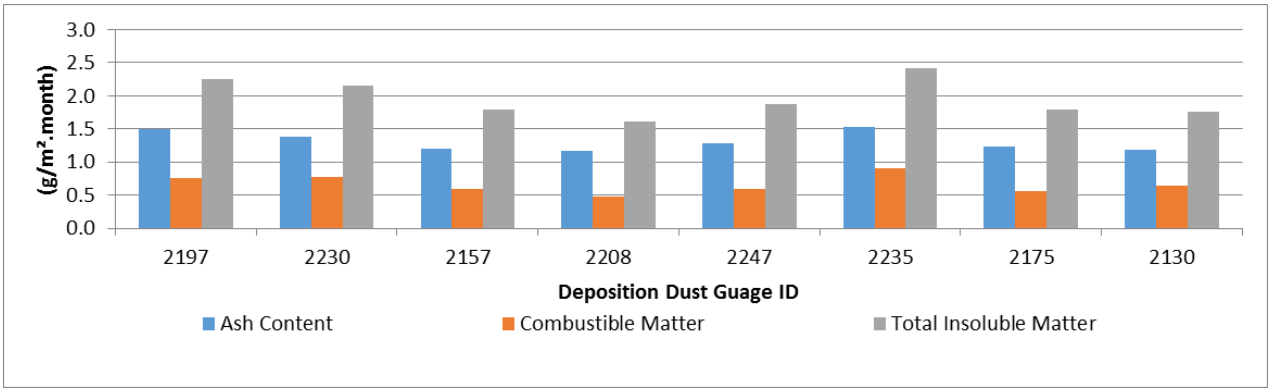


Figure F: Average Depositional Dust Gauge Results 2017

Total Suspended Particulates

Drayton operates two high volume air samplers (HVAS) at locations indicated in **Figure G** below. The Met Station monitor is located on site in the CHP area and is used to indicate TSP levels on site. The Lot 22 monitor is located offsite, within the Antiene rural sub division close to a residential premises, and is used for compliance purposes. Both monitors were calibrated every two months throughout the 2017 reporting period.

Drayton's TSP sampling program follows the OEH guidelines of a six-day rotational cycle. The HVAS and measurement also conform to '*AS 2724.3 – 1984: Particulate Matter – Determination of Total Suspended Particulates (TSP), High Volume Sampler Gravimetric Method*'. Compliance is determined by comparing the results from the HVAS sampling to the impact assessment criteria identified in PA 06_0202 and outlined in **Table 13**.

There were no exceedances of the TSP impact assessment criteria recorded during the reporting period.

Figure 8 presents the Antiene station Lot 22 TSP results for the entirety of the 2017 reporting period. The 2017 annual average TSP for this location was 51.9 µg/m³, well below the annual average limit of 90 µg/m³ (see **Figure I**). The annual mean results are summarised in **Table 14** with the complete results for the 2017 reporting period presented in **Appendix C**.

The 2007 EA prediction for the annual TSP concentrations due to emissions from Drayton and other sources for year 10 for representative residence 14 was 70.2 µg/m³. The 2017 annual concentration of 51.9 µg/m³ and the long-term average of 52.4 µg/m³ (see **Table 14**) are below the EA prediction and required limits.

Table 13: Long term impact assessment criteria for TSP

Pollutant	Averaging period	Criterion
Total suspended particulate (TSP) matter	Annual	90 µg/m³

Figure G: Real-time Dust Monitoring Equipment

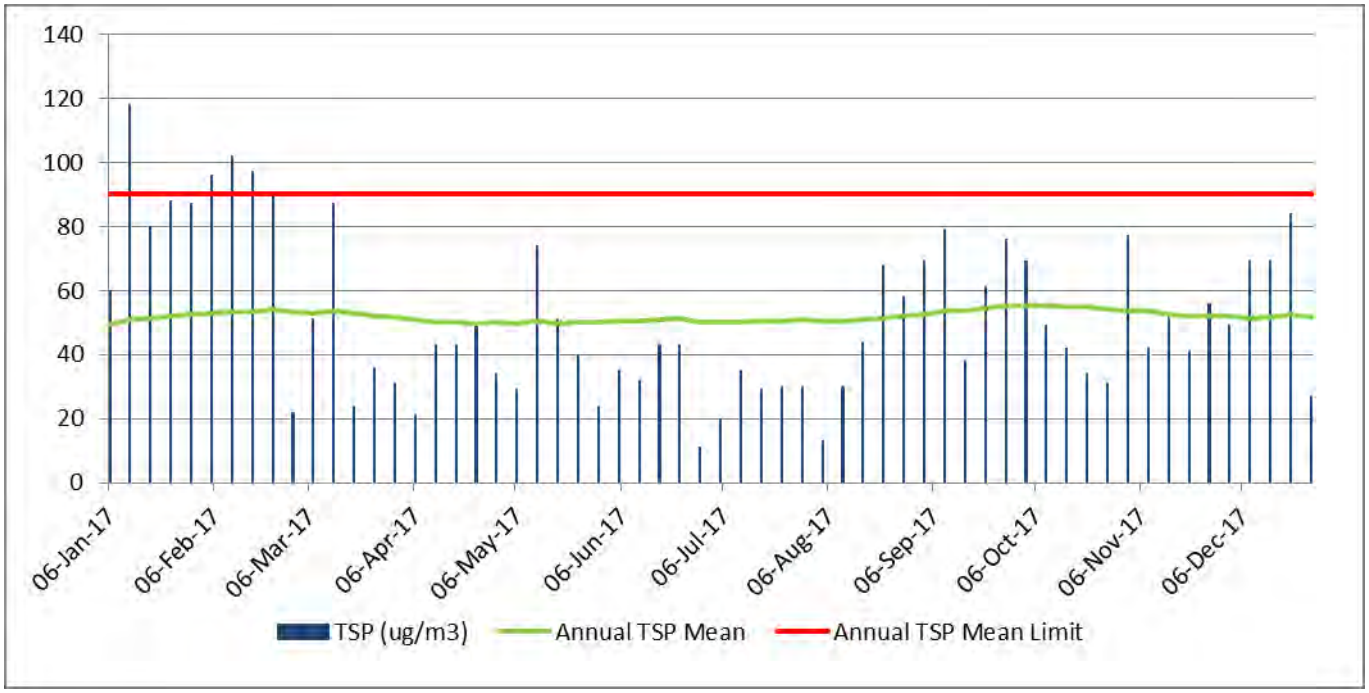


Figure H: TSP from Lot 22 HVAS 2017

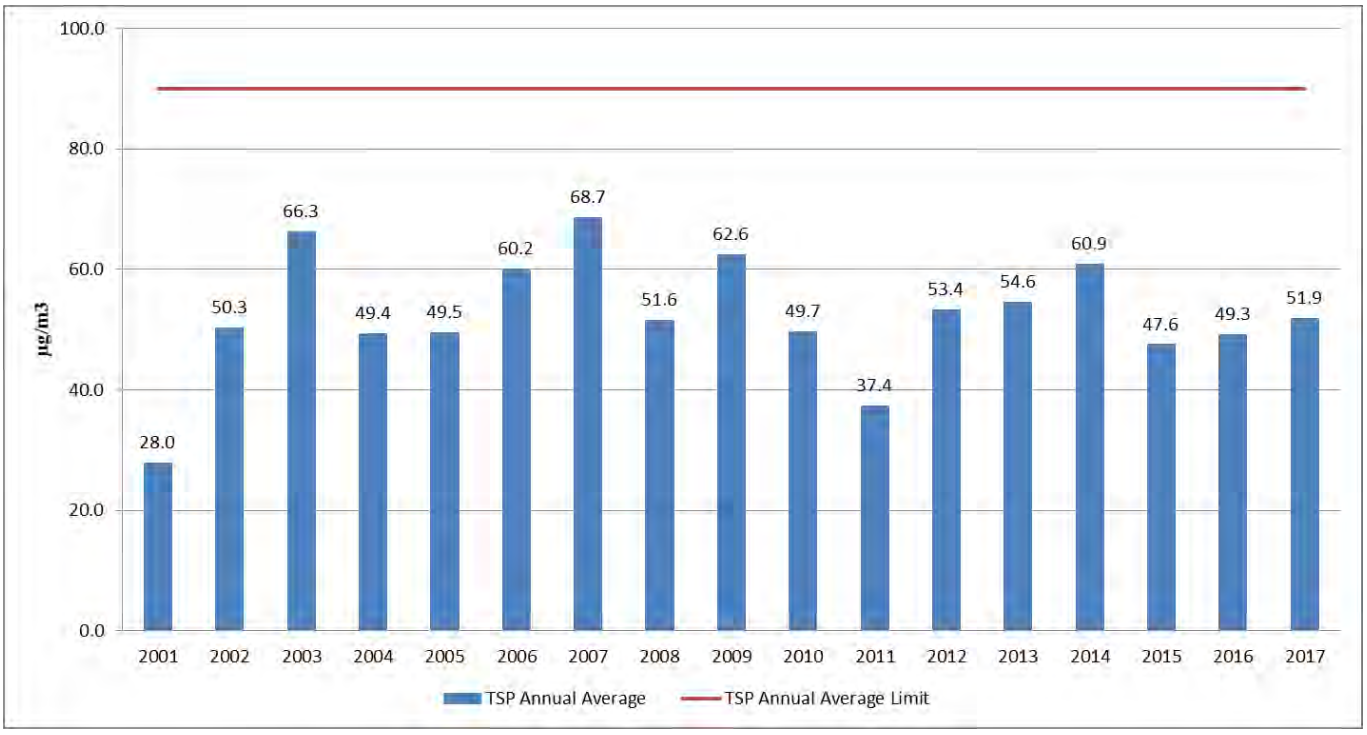


Figure I: Long Term Annual Average TSP from Lot 22 HVAS

Table 14: Total Suspended Particulates 2017

Location	Yearly Average (µg/m3)	Range (µg/m³)	No. Samples	Long Term Average µg/m³	EA Prediction Residence 14 Year 10
Lot 22 Antiene	51.9	11 – 118	60	52.4 (2001 – 2017)	70.4

PM_{10}

Drayton's Tapered Element Oscillating Microbalance (TEOM) continuously monitors PM_{10} at a location between Drayton's mining operations and the near neighbours' boundaries (Lot 9 TEOM) (refer to **Figure G**). It is used to indicate real time dust levels between the operation and nearby residents. The TEOM was calibrated in March, June, August and December 2017 in accordance with AS3580.9.8-2008 and the TEOM Service Manual. It is required that dust levels at neighbouring residences fall below the impact assessment criteria identified in PA 06_0202 and outlined in **Table 15** in order to be compliant with licence conditions.

There were no exceedances of the PM_{10} impact assessment criteria during the reporting period.

Table 15: Short and long term impact assessment criteria for PM10

Pollutant	Averaging period	Criterion
Particulate matter <10µm (PM10)	24 hour	50 µg/m³*
Particulate matter <10µm (PM10)	Annual	30 µg/m³

**Incremental increase in PM_{10} concentrations due to the mine site alone*

The 2007 EA prediction of the annual PM_{10} concentrations due to emissions from Drayton and other sources for Year 10 predicted that the annual average PM_{10} concentrations from all sources for representative residence 72 (Lot 9 Antiene) would be 21.4 µg/m³. The 2017 annual average concentration of PM_{10} at the Lot 9 TEOM was 16.0 µg/m³ and is below the EA's predicted level.

The real time dust monitoring results show that the annual average PM_{10} criterion of 30 µg/m^3 was not exceeded in 2017 (see **Figure J**). Throughout the 2017 reporting period the 24-hour average PM_{10} results did not exceeded the 50 µg/m^3 criterion.

Figure J also indicates that PM_{10} results from the Muswellbrook UHAQMN monitor also remained below the 24-hour average 50 µg/m^3 criterion for all days except 12th February and 15th December 2017. On 12th February 2017, the 24-hour average for the Muswellbrook UHAQMN monitor was 56.5 µg/m^3. Drayton's Lot 9 Antiene TEOM recorded a 24-hour average of 46 µg/m^3 on the same day. Conditions at the time were extreme, with the maximum daily temperature above 45°C for the third day in a row. Conditions were generally dry and there were bushfires burning near Cassilis and Dunedoo with strong westerly to south easterly winds spreading the smoke and ash across the region. On 15th December 2017, strong south easterly winds contributed to high regional dust levels with the Muswellbrook UHAQMN monitor recording a 24-hour average of 50.8 µg/m^3. Drayton's Lot 9 Antiene TEOM recorded a 24-hour average of 47.3 µg/m^3.

There were two days in January (25th and 26th) and one in early February (4th) when technical difficulties with the Lot 9 Antiene TEOM caused erroneous data to be recorded for the 24-hour average. The problem was caused by the installation of a new air conditioning unit on 25th January 2017 and was rectified quickly. The Lot 9 Antiene TEOM lost data between 9th and 12th December due to power failure caused by a tripped circuit breaker. Power was restored and lost twice during the period before the cause was identified as the air conditioning unit which was put on a different circuit to prevent reoccurrence. PM_{10} data is available from an alternate Drayton TEOM on Balmoral Road for all of these occasions.

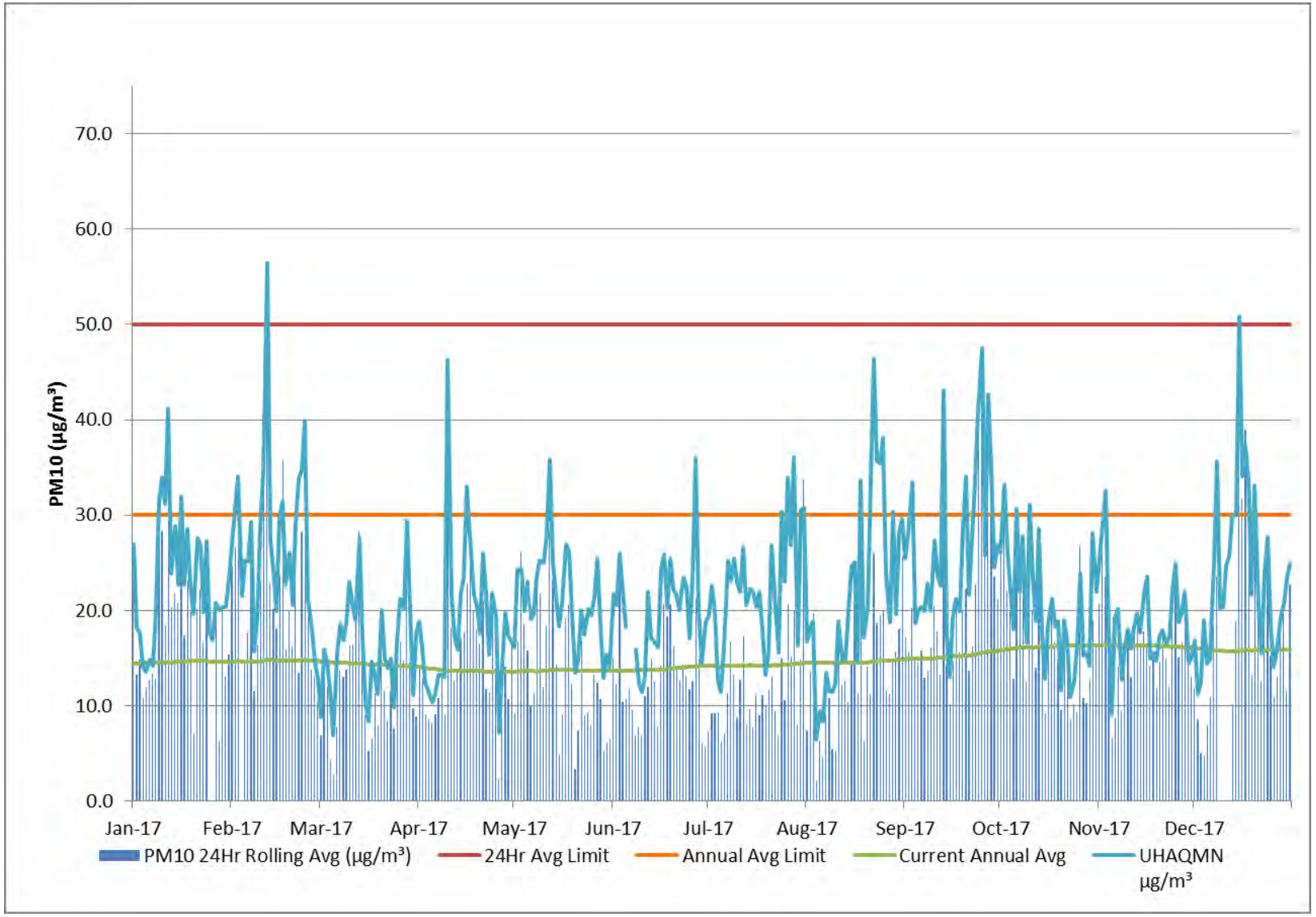


Figure J: PM_{10} Data (2017)

E-Sampler Network

Throughout the reporting period, Drayton operated four E-Sampler units for monitoring of continuous PM_{10} levels (see **Figure G**). These units are positioned to capture particulate matter concentrations both upwind and downwind of operations.

As discussed in **Section 6.1** the dominant wind directions at Drayton are south-easterlies in the summer months and north-westerlies in the winter months. E-Samplers 1 and 2 are located north and south of the operation respectively whilst E-Samplers 3 and 4 are located to the east and west respectively.

The E-Samplers are used to continuously monitor real time trends in PM_{10} concentrations as well as for investigating elevated PM_{10} levels or air quality complaints. Site personnel have the ability to access E-Sampler levels in real time to identify potential sources of PM_{10} and make operational decisions based on this real time data.

During the Reporting Period the E-Samplers were subject to infrequent periods of breakdowns. Faults were detected promptly and, where the fault couldn't be rectified in the field, the faulty unit was replaced with the spare E-Sampler unit that was purchase for such occasions. Continuity of monitoring in 2017 improved significantly over 2016; however, continuous PM_{10} dust readings at all locations was not always possible. Reasons for the breakdowns included power outages, damaged units, invalidated or irregular data and monitors not functioning in accordance with their intended capability i.e. low or irregular air flow. Further, if the spare unit failed whilst another unit was off site undergoing repairs data was unable to be captured from a single location during this time.

A monthly maintenance and calibration program was conducted in 2017, with a contractor engaged to inspect, test and maintain the units on a monthly basis. Real time data feed is also checked on a regular basis to ensure early detection of faults.

Continuous PM_{10} monitoring at the Drayton TEOM provides the most reliable method of measuring potential dust impacts on rural residential properties to the north of the mine. Monitoring data obtained from these units indicates that the 24 hr PM_{10} average did not exceed the 50 µg/m³ criterion during the reporting period (see **Figure J**).

6.2.4 Greenhouse Gas and Energy Efficiencies

During the 2016/2017 financial year Drayton reported to the Clean Energy Regulator a total of 11,329 t CO2-e in scope 1 emissions and 9,361 t CO2-e in scope 2 emissions. Also during this financial year, Drayton consumed 551,835 gigajoules of energy and produced 12,097,889 gigajoules of energy in the form of coal mined. These results represented a significant decrease in emissions and the amount of energy consumed and produced.

Closure of the mine is the main reason for the decline in emissions and energy consumed/produced. Production figures for the next period are expected to be zero with further significant reductions in emissions and energy consumption expected. With reduced personnel onsite, unused offices and buildings have been closed to reduce energy use and cost associated with care and maintenance of the site. The sale of the mining fleet in early 2017 has significantly contributed to the decline in emissions and the sale of the dragline in December 2017 is expected to continue the decline in energy consumption in 2018 when compared to the operational phase

of the mine. Resumption of bulk rehabilitation earthworks in 2018 may see an increase over the 2017 energy consumption figure.

6.3 Erosion and Sediment

During the 2017 reporting period, erosion and sediment control at Drayton was managed in accordance with the site Water Management Plan and the *Managing Urban Stormwater: Soils and Construction* guidelines. The control measures in place throughout the year included:

- Sediment traps and catch drains in the runoff zones from industrial areas;
- Collection of surface runoff in established dams downstream of disturbed areas;
- Progressive rehabilitation of disturbed areas as soon as practicable; and
- Contour banks on rehabilitated land designed at 0.5% - 1% grade and spaced to minimise down slope flows.

Water from wash-down bays is collected in a series of sumps that were de-silted on a regular basis whilst this area was operational. Any overflow from these sumps goes into the oil pollution control dam.

The Rail Loop Dam, which collects runoff from the CHP area, has been designed so runoff water travels through a series of sediment ponds prior to entering the dam. Drayton does not possess a licence to discharge water off site so water and sediment is retained on site. An extensive program was implemented in May 2017 to remove accumulated coal fines and sediment from the Rail Loop Dam, with the excavated material trucked to the north pit for disposal.

Periodic checks of rehabilitated areas are conducted to identify any erosion concerns and implement remediation measures. Repairs to contour banks were undertaken in 2017 following an intense rainfall event in March 2017 which resulted in some erosion within recently prepared areas. These areas were vulnerable to erosion as vegetation hadn't established on these recently seeded areas prior to the storm event. These areas were re-cultivated and re-seeded in October and November 2017.

On 20th December 2016 Drayton was subject to a Dam Management Audit which was led by the EPA. The audit focused on the effective management and compliance of onsite dams against relevant approval conditions. Other regulatory authorities from DRE, DP&E and the DSC also assisted with the audit. Recommendations arising from this audit were provide to Drayton by the audit regulatory representatives in March 2017. Issues raised are listed in **Table 16.**

Table 16: Dam Safety Audit Actions

Department / Action Number	Action Required	Due Date specified in correspondence	Response from Drayton
EPA 29th March 2017			
02.1a (1)	The licensee must maintain the Rail Loop Dam and the Oil Pollution and Control Dam in a proper and efficient manner.	28th April 2017	Removal of all sediment from the Rail Loop Dam was completed in May 2017. Some sediment was removed from the OPC Dam, with the remainder to be recovered when this facility is decommissioned.
02.1a (2)	The licensee must undertake a review of the mine dam inspection regime so that the dams and associated infrastructure are maintained in a proper and efficient condition	28th April 2017	The Rail Loop Dam has been included in the weekly dam inspection regime and added to the inspection checklist.
98 D (1) (a)	The licensee must provide the EPA a copy of the site's full Pollution Incident Response Management Plan (PIRMP)	ASAP	PIRMP submitted to EHP on the 28th March 2017.
Further Observation	Update required to the site's Water Management Plan		The Drayton Water Management Plan was updated and subsequently approved by DP&E
Dept. Planning & Environment			
5.6.3.4	Drayton will prepare a quarterly summary of water monitoring results and make these publically available via the Drayton website, as per commitment 5.6.3.4 in the site's Water Management Plan.	Not Stated	Quarterly water monitoring updates are now provided on the Drayton website

6.4 Contaminated Land

Drayton maintains a register of locations on site that are known or potential locations of land contamination. Throughout the reporting period there were no new areas of contaminated land added to the land contamination register.

The areas that Drayton classifies as contaminated did not change from those described in the 2016 AEMR. Potentially contaminated sites includes all areas around the workshop, stores areas, west fuel bay, main diesel facility, East Pit, Industrial Dam, Savoy Dam, Oil Pollution Control Dam, Access Road Dam and its upstream catchment. Refer to **Section 6.16** for further information on hydrocarbon contamination.

A phase 1 preliminary contaminated land assessment was conducted by ERM in May 2017. The investigation included a review of site data, review of the spill register, identification of areas where contamination may have occurred, a review of site management plans, site inspections, field observations, interviews with employees, targeted shallow soil sampling and soil analysis.

Soil sampling was conducted at the following locations:

- The Bulk Diesel Storage Facility and the site of the 2014 Diesel Spill;
- Refuelling Bays (Light and Heavy Vehicle, West (Inpit) Refuelling Area);
- Equipment Wash-pad Area;
- Coal Handling Plant (CHP) and Run of Mine (ROM) Areas;
- Heavy Vehicle Workshop and Boilermaker Shed;
- Bio-remediation Cells;
- Fire Training Area (Rescue Station);
- Oil Drum Storage Area;
- Oil Pollution Control Dam;
- Rail Load Out Facility and associated Overland Conveyor; and,
- The Explosive Storage Facility.

The areas of potential environmental concern identified generally related to above and below ground storage and transfer of petroleum hydrocarbons, activities within the heavy vehicle workshop, coal handling and rail facilities, and the storage and use of fire-fighting foams.

Soil sampling completed as part of the preliminary investigation found contaminants of concern within the subsurface at a number of locations; however, it did identify concentrations of constituents of concern in excess of adopted Commercial / Industrial land use based criteria for human health exposure.

Based on information reviewed in compiling the report and laboratory analysis completed on collected soil samples, no contaminated areas were identified that warranted notification to the EPA under Section 60 of the Contaminated Land Management Act 1997 (CLM Act).

6.5 Bioremediation

Hydrocarbon contaminated soil is bio-remediated on site at a purpose built facility. The operation of the bioremediation area is described in the site's Bioremediation Management Plan. The volume of material placed in the bioremediation cells reduced significantly in 2017 due to the cessation of mining operations. Small quantities of contaminated soil were generated in association with clean-out of sumps and decommissioning of the site's mobile equipment fleet. It is estimated that <40m^3 of material was placed in the bioremediation cells in 2017.

Management activities during the year included:

- Cultivation of the cells in February, May and August;
- Addition of 'micro-blaze' bioremediation agent in June and December;
- Soil sampling and hydrocarbon analysis in April and August;
- Cell rotation in May; and,
- Spraying of weeds around the facility in March and November.

The contents of one 'B' cell were excavated and hauled to the EN Void for disposal after analysis confirmed that the material was within hydrocarbon limits. The volume of material relocated is estimated to be <50m^3. No material was taken off site for disposal in 2017.

6.6 Flora and Fauna

Drayton Environmental Management Plans relating to threatened flora and fauna include:

- Offset Strategy;
- Rehabilitation and Offset Management Plan; and
- Flora and Fauna Management Plan.

In accordance with the above documentation, monitoring of threatened flora and fauna within the biodiversity offset and rehabilitation areas is completed annually. A Flora and Fauna Monitoring Report was completed by Eco Logical Australia (ELA) for the 2017 reporting period. Flora and fauna monitoring was undertaken between 4th and 9th September 2017. The surveys were undertaken by ELA Ecologists.

A representative network of 27 rehabilitation and offset monitoring sites were included in the 2017 monitoring program. Seven of the 27 monitoring sites were surveyed for fauna and all sites were surveyed via floristic and biometric sampling methods.

The results of the 2017 monitoring program are likely to have been influenced by the protracted period of below average rainfall experienced for the five months prior to the monitoring program. A discussion as to the results from the monitoring program is provided below.

6.6.1 Flora Monitoring Results

Flora monitoring was undertaken during the reporting period in rehabilitation and offset areas. No additional threatened flora species or communities were identified in the reporting period. The EEC, Hunter Lowland Redgum Forest (HLRF) as listed under the *Threatened Species Conservation Act 1995* (TSC Act), has been previously identified.

A population of Pine Donkey Orchid (*Diuris tricolor*) was identified in the Drayton Wildlife Refuge during a focussed investigation program conducted in 2015 and confirmed by specialist botanical ecologists. The species is listed as vulnerable under the TSC Act.

The 2017 Flora and Fauna Monitoring Report also reviewed the biodiversity offset and rehabilitation areas against key performance objectives and completion criteria as identified in the following management plans:

- Offset Strategy;
- Rehabilitation and Offset Management Plan; and
- Flora and Fauna Management Plan.

Malabar has commissioned an agronomist to review finding and develop action plans where required to meet completion criteria. Notable findings from the flora monitoring are as follows:

- Natural vegetation sites met all completion criteria targets in 2017 except one site that was found to have no mid-storey and ground cover layers naturally regenerating.

- Five out of ten woodland sites are meeting the completion criteria targets for bare ground with no site exhibiting patches of more than 10m² across all sites.
- Less than half of the woodland rehabilitation sites are underperforming for canopy cover, shrub cover and native groundcover; however, all sites had seedlings observed of key species from all structural layers except the ground stratum.
- Tubestock losses exceeded the target at all sites subject to planting.
- Of the woodland rehabilitation sites greater than five years old, three sites out of ten are meeting targets with regard to priority weed cover. All of the sites less than five years old are underperforming for total weed cover.
- The majority of pasture rehabilitation monitoring sites are meeting the performance criteria target for effective cover of pasture species, although one has a very low pasture species cover.
- Two pasture rehabilitation sites met the performance criteria target for target pasture species and none of the sites are currently meeting the targets with regard to diversity of perennial species.
- All of the pasture rehabilitation monitoring sites are meeting targets for priority weed cover.
- All pasture sites are underperforming in perennial diversity with three sites dominated by one pasture species that comprised 75-80% cover.

6.6.2 Fauna Monitoring Results

Notable findings from the fauna monitoring are as follows:

- A total of 72 fauna species were recorded across all seven monitoring sites, including eight threatened species and three vertebrate pest species. Site 5a in the Southern Offset was the most diverse, with the highest number of native species. Site 9a, also in the Southern Offset, was the least diverse, having the least number of native species.
- Fauna species richness was consistently higher at intact (analogue) sites compared with rehabilitation sites as would be expected. Performance criteria were met at both natural vegetation sites and woodland rehabilitation with regard to native fauna and vertebrate pests.

A total of eighteen threatened fauna species and three migratory species have been recorded at Drayton during EA and subsequent fauna monitoring surveys. Threatened species occurring at Drayton are listed in the Flora and Fauna Management Plan. Management and preservation of existing habitat forms the basis of protection of these threatened species. Known habitat occurs mainly in remnant and regenerating areas of woodland in the Drayton Wildlife Refuge, Northern Offset and Southern Offset.

The 2017 Flora and Fauna Monitoring Report is appended to this AEMR as **Appendix I**.

6.6.3 Drayton Wildlife Refuge

In 1987 the Drayton Wildlife Refuge (see **Figure B**) was gazetted. It allows for planned land use of all areas of the Drayton land holding, whilst still respecting wildlife values. In the Drayton EA it was predicted that the 'Natural Zone' of the Drayton Wildlife Refuge would not be impacted by the Project and that the management of this area will compensate for the impacts of the project on flora and fauna. Besides providing a buffer zone between residents and the mine, the Drayton Wildlife Refuge continues to provide remnant woodland for natural ecosystems and threatened species.

During 2017 a section of fencing running parallel to Wire Lane was replaced and signage erected to prevent unauthorised firewood removal from this remnant forest area.

6.6.4 Feral Animal Control

Feral animals, such as cats, wild dogs, rabbits and foxes, have been identified at Drayton. Control strategies undertaken include the use of poison baits to control these animal populations. Drayton implements a coordinated feral animal control program with neighbouring property holders. This integrated approach is designed to maximise effectiveness of control for target species across a broad area.

In October 2017 a 1080 Wild Dog baiting program was conducted in coordination with local land owners within the Mt Arthur Wild Dog Association area. Baiting occurred over a three week period. 32 baits were distributed adjoining tracks around the site, with 12 in the main infrastructure area and 20 in the mining domain. The baiting was a success with 12 baits taken by foxes and seven baits taken by wild dogs.

Foxes, one wild dog and a European hare were recorded during the 2017 fauna monitoring. Numbers recorded were less than recorded in previous years monitoring, with only five individual species recorded, compared to twelve individuals during the 2016 monitoring program.

All feral animal control needs to be carefully planned and relevant guidelines adhered to, however the Southern Offset is particularly sensitive due to the presence of Spotted-tail Quoll. Due to the potential vulnerability of the species to 1080 (sodium fluoroacetate), fox, cat and rabbit baiting was not be undertaken within an exclusion zone around the creekline habitat in the Southern Offset, and any baiting in the surrounding applied precautions, including burying meat baits to a depth of at least 10 cm and avoidance of baiting during the peak breeding season of the species (July to September).

6.6.5 Pest Animal Control

Kangaroo species, especially the Eastern Grey Kangaroo (*Macropus giganteus*), have reached high numbers throughout the mine site and adjoining properties. Excessive kangaroo numbers have resulted on impacts to the establishment and ongoing success of rehabilitated areas, with grazing being especially detrimental to the survival rate of young trees.

In June and July 2017, a licenced commercial shooter was used to harvest 100 male kangaroos for meat production. An additional 200 Eastern Grey Kangaroos were culled on site. These activities were conducted in accordance with s.120 and s.121 of the National Parks and Wildlife Act 1974.

6.7 Weeds

Weeds are targeted for control based on priority. High priority weeds include noxious weeds, weeds establishing on new rehabilitation areas and environmental weeds spreading to previously unaffected areas. Weed control is ongoing with control scheduled opportunistically throughout the year depending on weather conditions and life stage of the species being targeted. Treatment occurs during flowering, where possible, to assist with identification and ensure weeds are treated prior to seeding.

6.8 Blasting

6.8.1 Management System

Blasting is permitted under Drayton's Project Approval between the hours of 0900 and 1700 (Eastern Standard Time) Monday to Saturday and between 0900 and 1800 (Daylight Savings Time) Monday to Saturday. Drayton's Mining Lease, PA 06_0202 and EPL 1323 include requirements for the monitoring and control of blasting impacts (see **Table 17**) at any residence on privately-owned land. A maximum of two blasts per day can be carried out with a limit of eight blasts per week averaged over a 12 month period.

Drayton did not undertake any blasting during the 2017 reporting period.

Table 17: Blasting and Vibration Criteria

Airblast Overpressure Level	
(dB(L)in Peak)	**Allowable Exceedance**
115	5% of the total number of blasts over a period of 12 months
120	0%
Peak Particle Velocity (Ground Vibration)	
mm/sec	**Allowable Exceedance**
5	5% of the total number of blasts over a period of 12 months
10	0%

Procedures have been implemented to ensure Drayton minimises the impact of blasting on near neighbours and operates within licence and project approval conditions. They include the following:

- Loading blasts according to Drill and Blast Engineer's design with attention given to factors such as:
    - charge weight per delay;
    - loading pattern of holes;
    - stemming used;
    - firing sequence and direction;
    - maximum instantaneous charge; and
    - type of blast.

- Accountability for blasting compliance lies primarily with the Mining Operations Department;
- Meteorological conditions are considered when firing shots;
- Waveforms of both air blast and vibration are available for all blasts;
- Implementing an NN Strategy for blasting in the north pit;
- Implementing a road closure process for closing Thomas Mitchell Drive during blasting in the north pit (within 500m of the road);
- Implementing electronic detonation on most blasts in the NN area; and
- Designing blasts to remain below internal limits and well below regulatory limits.

Drayton has also participated in an ongoing research project, funded by the Australian Coal Association Research Program (ACARP), to identify the specific weather conditions relating to blasting activity. This is a joint research project involving a number of Upper Hunter mining companies. This project is referred to as the SODAR project.

6.8.2 Monitoring System

Drayton used an internet based blast monitoring system which gives access to immediate blasting information for all blasts. The blast monitoring units also allow additional monitoring to be undertaken in specific locations as required. The units operate between approved blasting hours and automatically trigger once a vibration or overpressure event is recorded. There are three community based blast monitors at locations in the Antiene area and two monitors at the Ash Dam, one on the toe, and one on the crest of the wall. The locations of the five blast monitoring units are shown in **Figure K**.

No blasting was conducted during the 2017 AEMR reporting period.

Figure K: Blast Monitoring Sites

6.9 Operational Noise

6.9.1 Management System

Drayton implemented a number of noise management controls during the operational phase of the mine. These controls included mine planning, operational and engineering measures, and a real-time monitoring system.

Limited noise generating activity occurred at Drayton during the reporting period and no activity occurred during the evening or at night.

6.9.2 Monitoring System

Drayton undertakes a combination of independent monitoring and real-time monitoring in order to assess mine noise criteria stipulated in EPL 1323 and PA 06_0202 (see **Table 17**).

Table 17: Noise Impact Assessment Criteria

Land ID Number	Day	Evening	Night	
	L_{Aeq}(15min)	L_{Aeq}(15min)	L_{Aeq}(15min)	L_{A1}(1min)
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47

Land ID Number	Day	Evening	Night	
	L_{Aeq}(15min)	L_{Aeq}(15min)	L_{Aeq}(15min)	L_{A1}(1min)
All other privately-owned land	35	35	35	45

Independent Monitoring

Independent noise monitoring is undertaken to quantify the overall noise levels at the nearby residences and determine compliance with noise criteria by Drayton's operations. The monitoring is carried out on a monthly basis by an acoustic engineer who incorporates attended monitoring data into a site model to provide a compliance report. This monitoring also fulfils the requirement of EPL 1323 Condition M8.1 that noise must be monitored every six months from the premises to determine compliance with the noise limits. Drayton has continued to undertake independent attended noise monitoring on a monthly basis throughout 2017 to determine compliance against noise criteria. Monitoring has continued beyond the cessation of mining and processing in order to further assist in determining baseline noise levels.

Drayton's Project Approval details noise impact assessment criteria for 28 specific residential locations (see **Table 17** above). For logistical reasons it is not reasonable to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken is to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in PA 06_0202. Noise measurement locations for the attended noise survey are listed below and depicted in **Figure L**:

- Doherty
- Kerr
- Wilson*
- Smith*
- Skinner
- Robertson
- Sharman
- Horder

** Additional locations contained in EPL 1323 but not in PA 06_0202.*

Three sets of measurements are made over the "circuit", one during the day time period (quarterly) (before 6 pm), one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm).

Real Time Monitoring

Real-time noise monitoring involves the use of two BarnOwl® noise monitoring systems. Multiple microphones allow the BarnOwl® to distinguish the direction of noise sources.

One BarnOwl® has been installed at Lot 9 Antiene, approximately 150 m from the Drayton rail spur, and in close proximity to the mine's near neighbours (see **Figure L**). This station enables proactive management to minimise noise emissions from the site should a complaint be received.

A second BarnOwl® was installed at the end of Balmoral Road in the Antiene area. This monitor is operated in conjunction with Mt Arthur Coal and monitors noise levels representative of Balmoral Road residences.

No noise complaints were received during the 2017 reporting period.

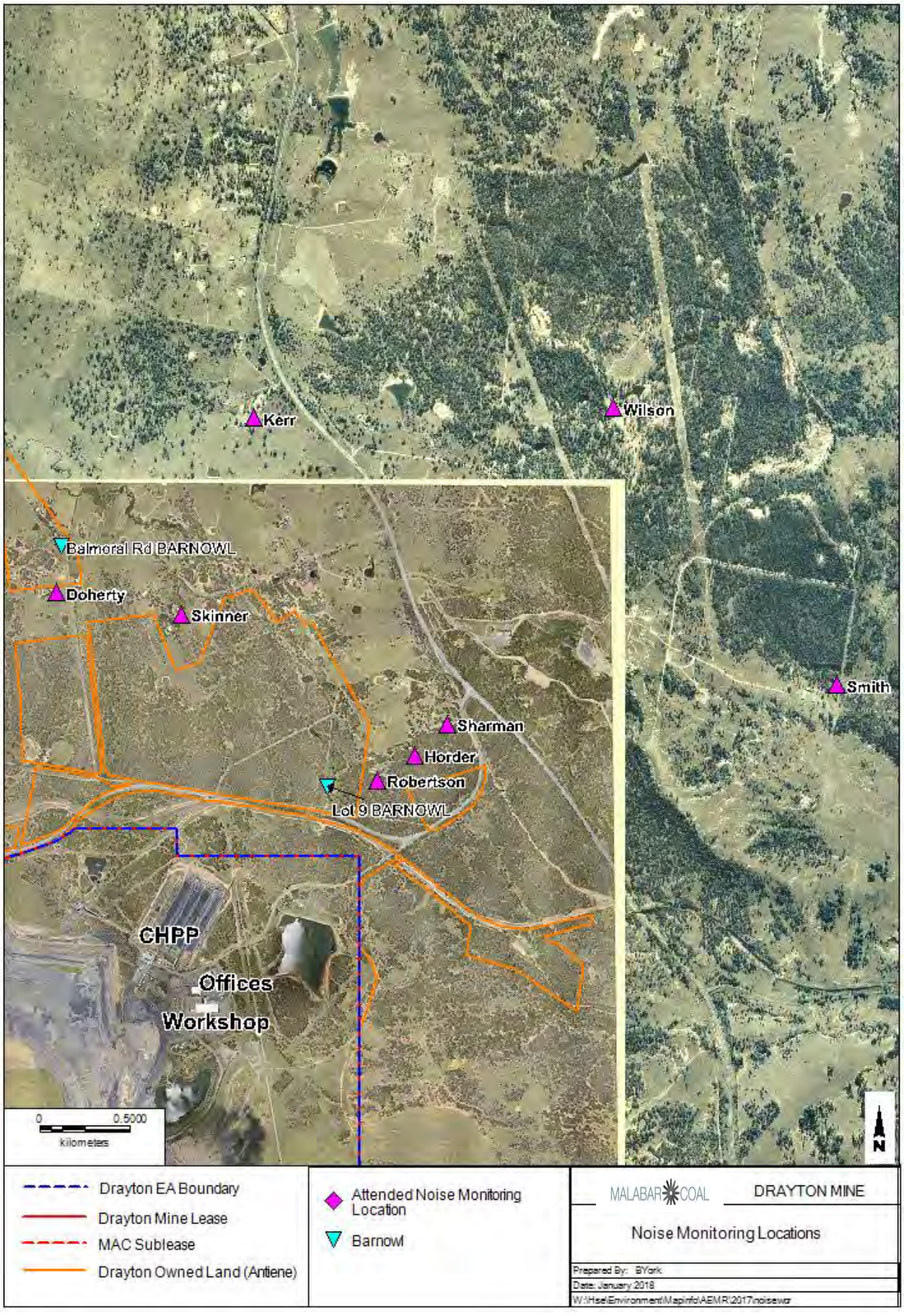


Figure L: Noise Monitoring Locations

6.9.3 Results

Independent Attended Monitoring

Independent noise monitoring was undertaken monthly during 2017 to quantify the overall noise levels at the nearby residences and determine compliance with noise criteria by Drayton's operations. In 2017 a noise compliance assessment report will be submitted to the EPA with the Annual Return as set out in Condition R1 of EPL 1323.

Predicted noise levels in the 2007 EA were reported for years 1, 5 and 10 of the project. 2017 is equivalent to year 10 for the project and as a result year 10 predictions have been used below to compare actual monitoring results to predicted noise levels. All of the results of the attended noise monitoring were below that of predicted noise levels in the 2007 EA for year 10 of the project.

Table 18 to **Table 21** below present the results for day, evening and night monitoring together with the EA prediction for comparison. No exceedance of operational noise criteria was detected during the 2017 reporting period in **Appendix H** of this AEMR**.**

Table 18: Noise Results Day LAeq (15 min)

Daytime* Measured Noise Results – Drayton Contribution dB(A) $L_{eq\ (15\ min)}$													
Location (Criterion)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	EA Prediction (Yr 10)
Doherty (41)			<20			<20			<20			<20	40
Kerr (36)			<20			<20			<20			<20	34
Skinner (39)			<20			<20			<20			<20	37
Robertson (36)			<20			<20			<20			<20	34
Sharman (35)			<20			<20			<20			<20	32
Horder (35)			<20			<20			<20			<20	33
Wilson (35)			<20			<20			<20			<20	<30
Smith (35)			<20			<20			<20			<20	<30

** Day period results only collected on a quarterly basis*

Table 19: Noise Results Evening LAeq (15 min)

Evening Measured Noise Results – Drayton Contribution dB(A) $L_{eq\ (15\ min)}$													
Location (Criterion)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	EA Prediction (Yr 10)
Doherty (41)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	41
Kerr (37)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	35
Skinner (40)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	39
Robertson (37)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	36
Sharman (35)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	34
Horder (36)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	35
Wilson (35)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	30
Smith (35)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	<30

IA = Drayton Inaudible

Table 20: Noise Results Night LAeq (15 min)

Night Measured Noise Results – Drayton Contribution dB(A) $L_{eq\ (15\ min)}$													
Location (Criterion)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	EA Prediction (Yr 10)
Doherty (39)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	39
Kerr (37)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	35
Skinner (39)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	39
Robertson (42)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	42
Sharman (41)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	40
Horder (42)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	42
Wilson (35)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	34
Smith (35)	IA	IA	<20	IA	IA	<20	<20	<20	<20	<20	<20	<20	31

IA = Drayton Inaudible

Table 21: Noise Results Night LA1 (1 min)

Night Measured Noise Results – Drayton Contribution dB(A) $L_{1\ (1\ min)}$*													
Location (Criterion)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	EA Prediction (Yr 10)
Doherty (47)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
Kerr (47)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
Skinner (45)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
Robertson (47)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
Sharman (47)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
Horder (47)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
Wilson (45)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
Smith (45)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a

** $L_{1\ (1\ min)}$ night period required for EPL 1323, IA= Inaudible, NA=Drayton Operations not active in this period*

6.10 Visual Aesthetics and Lighting

As predicted in the EA assessments, Drayton's operations have a low visual impact as a result of judicious clearing during initial construction. Remnants of the initial woodland have been retained around and throughout the site by careful layout of infrastructure and clearing of the minimum area required. Mature trees provide effective screening of areas such as the CHP, Rail Loadout facilities and general administration area.

Tree establishment continues to be a component of rehabilitation programmes. These trees and shrubs will provide additional screening of mining activities as well as a corridor for wildlife movement between refuge and offset areas. During 2007, some 2,060 native tree seedlings were planted along Thomas Mitchell Drive to act as visual barrier for future mining developments. The seedlings were successfully established and now provide a screened barrier for travellers along Thomas Mitchell Drive. Further tree plantings occurred throughout 2012, 2014 and 2015. Trees were planted in areas that are visible to both the New England Highway and Thomas Mitchell Drive to provide future relief from linear rehabilitated contours.

Mobile lighting was not utilised during 2017 due to cessation of mining operations in October 2016.

6.11 Aboriginal Heritage

Drayton maintains an Aboriginal Cultural Heritage Management Plan (ACHMP) in accordance with PA 06_0202. The ACHMP provides a set of operational procedures that guides Drayton in the management of Aboriginal cultural heritage issues within the mine development context.

The EA predicted that 29 of the 39 Aboriginal sites identified would likely be impacted by the project. The Aboriginal heritage sites consisted of isolated artefacts and areas where transient communities may have travelled. Of the 39 sites located, 13 sites were conserved as part of the Drayton Mine Extension area development. In 2009 the remaining 26 sites were subject to various mitigation salvage procedures prior to impact from mining development. The majority of these sites are considered to be of low scientific significance; however, Ramrod Creek R3 was considered to be of medium-high scientific significance following salvage works on a local level.

The 13 conservation sites all remain in situ, with fencing in place to demarcate the heritage sites. The artefacts salvaged in 2009 have continued to be stored by the Environment department for safe keeping.

Throughout the 2017 reporting period, there was no trigger for consultation with cultural heritage groups relating to the mining activities at Drayton.

6.12 Natural Heritage

No natural heritage sites have been identified on the mine site or on land under the control of Drayton.

6.12.1 Non-Aboriginal Heritage

The EA field survey identified five non-Aboriginal heritage sites within the EA boundary, none of which were statutory listed. One of these sites was determined to be of high local significance. It was predicted in the EA that this site would not be impacted by mining activities however a physical barrier was installed around the site to prevent accidental damage and maintain its heritage value.

6.13 Spontaneous Combustion

Drayton, along with other open cut coal mines mining the Greta Coal Measures, experiences spontaneous combustion within spoil, coal stockpiles and coal seams. As a result, a Spontaneous Combustion Management Plan is followed on site in order to meet both statutory and company requirements. This plan indicates the causes of spontaneous combustion, determines accountabilities for its management, lists remediation work to prevent recurrences, and specifies monitoring and reporting requirements. The pit is inspected on weekdays by an Open Cut Examiner (OCE). Remedial works such as capping or sheeting with inert material are initiated where outbreaks of spontaneous combustion are identified.

Monthly inspections are conducted by environmental personnel. This inspection utilises a thermal imaging camera to detect and monitor areas where heating is occurring. Drayton also completes six monthly reports to the EPA regarding spontaneous combustion monitoring and management.

Spontaneous combustion management activities during 2017 were carried out to manage isolated outbreaks where steam or smoke became evident. Various plant, including a D6 track dozer, a D11 track dozer and excavators were utilised to suppress spontaneous combustion outbreaks.

Table 22: Area affected by spontaneous combustion (1998 – 2017)

Year	Area Affected (m^2)	Year	Area Affected (m^2)
1998	82,837	**2008**	1,870
1999	57,854	**2009**	1,020
2000	26,251	**2010**	1,170
2001	6,745	**2011**	1,070
2002	1,870	**2012**	1,160
2003	3,140	**2013**	1,180
2004	3,940	**2014**	810
2005	3,370	**2015**	870
2006	3,480	**2016**	810
2007	3,720	**2017**	1150*

** As at 2017 Apr-Sep 6-Monthly Report to EPA submitted on 18th Oct 2017*

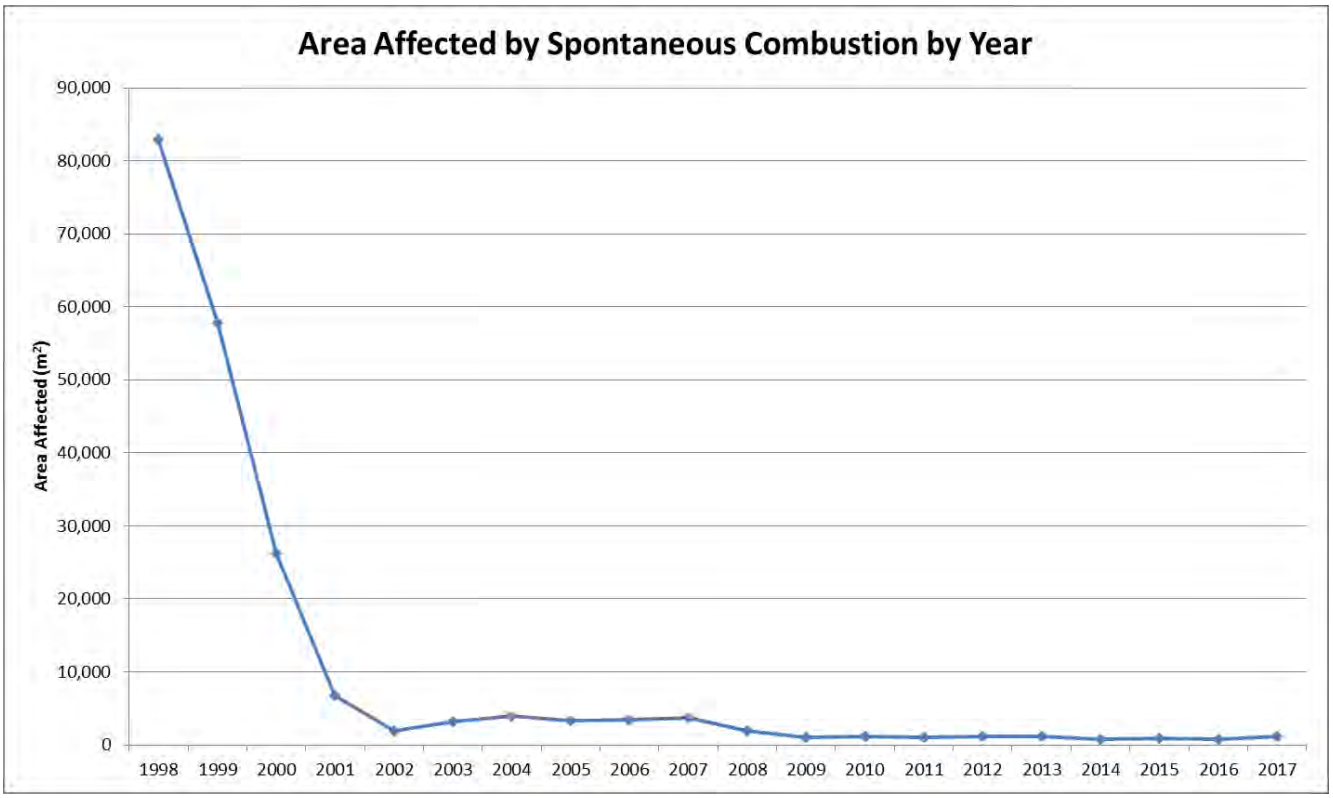


Figure M: Area affected by spontaneous combustion by year

Table 22 and **Figure M** outline the areas that have been affected by spontaneous combustion since 1998. This demonstrates that spontaneous combustion reduced substantially from the late 1990's. At the end of the reporting period, it was assessed that approximately 1150 m^2 of surface area was visibly affected by spontaneous combustion. These areas are currently being managed through a process of covering with inert material to smother outbreaks. Capping material will be placed over locations where material is susceptible to spontaneous combustion prior to rehabilitation of available areas.

6.14 Bushfire

During the 2017 reporting period, the risk of on-site bushfires was managed through a system of peripheral roads that act as firebreaks. Additionally, weeds and grasses growing around electrical substations and fuel storages were kept to a minimum. An inspection was carried out to assess the status of the Drayton property boundary and neighbouring properties regarding the potential for bushfires. The southern boundary fence line was slashed in November to ensure access in the event of a bushfire. Access tracks to all environmental monitoring site were also slashed to reduce the potential for dry fuel to come into contact with vehicle exhaust systems.

Representatives from Drayton attended the bushfire pre-season briefing at the Rural Fire Service Headquarters in Bulga in August 2017.

6.15 Mine Subsidence

Subsidence is not an issue at Drayton as it is an open cut coal mine with no underground workings or highwall mining.

6.16 Hydrocarbon Contamination

Drayton has various hydrocarbon storage locations. The primary diesel tank, with a capacity of 860,000 litres, is located near the workshop. Additionally, there is an in pit fuel facility, consisting of above ground diesel storage tanks with a total 220,000 litre capacity. Fuel has been removed from the in pit fuel storage tanks following cessation of mining.

All bulk storage tanks and containers of hydrocarbons are stored within appropriate bunding and kept in a neat and tidy condition. Contamination is kept at a minimum, with any moderate spillages (20 L or greater) being reported internally through Drayton's incident reporting system. Tanks and storage areas are located such that any incidents will not lead to offsite discharge and impacts. Concrete and earthen bunds were inspected throughout the reporting period for structural integrity and cleanliness. After rainfall events, rainwater is removed from bunds to ensure sufficient storage capacity in the bund in the event of a spill.

Drayton has an area dedicated to bio-remediating hydrocarbon contaminated soil which is located to the south of the workshop area. Remediated material is periodically removed from the cells and disposed of in pit once soil testing confirms that the material meets specifications as outlined in the approved Bioremediation Management Plan. Inspections of the facility are conducted and sediment samples taken and analysed for the presence of contaminants on an ongoing basis.

The bioremediation cells are cultivated periodically to aerate the soil and bioremediation agent and water is applied to assist in the biological degradation of the hydrocarbons.

Drayton continued the operation of its oil pollution control dam throughout 2017. This dam is located below the main workshop, vehicle wash down bays and lube facilities. Any runoff from

the industrial area reports to this dam via an oil separator that removes hydrocarbons from the water. Water from the Oil Pollution Control Dam passes through a second oil separator before flowing into the Industrial Dam for reuse on site. Hydrocarbons are collected in storage tanks which are serviced by a waste contractor as required and removed from site.

6.17 Waste Management

Drayton has existing waste management systems which, where appropriate, incorporate waste reuse and recycling and address issues relevant to the management of waste.

The volumes of different waste streams generated during 2017 are outlined in **Table 23** while the comparison of the waste volumes against previous years is shown in **Table 24**.

Table 23: Waste stream volumes generated in 2017

Waste Stream	Treatment and Disposal	Volume	Unit
Metal	Recycled off-site	127	Tonnes
General Waste	Off-site landfill	25	Tonnes
Confidential document bins	Off-site document destruction	1.2	Tonnes
Batteries	Recycled off-site	3.2	Tonnes
Empty 205L gallon drums	Recycled off-site	2	Each
Empty 20L drums	Recycled off-site	6	Each
Oil Filters	Recycled / disposed of off-site	501	Each
Oil	Recycled / disposed of off-site	7,500	Litres
Mixed Regulated Waste	Off-site disposal at licensed regulated waste facility	0.5	Tonne
Sewage	On-site treatment and disposal	12,200	Litres
Sewage	Off-site treatment and disposal at licensed sewerage treatment facility	0	Litres

Table 24: Waste stream volumes comparison against previous years

Waste Stream	2015	2016	2017	Unit
Metal	192	545	127	Tonnes
General Waste	183	105	25	Tonnes
Confidential document bins	1.4	4.0	1.2	Tonnes
Batteries	8.8	6.7	3.2	Tonnes
Empty 205L gallon drums	25	4	2	Each
Empty 20L drums	186	98	6	Each
Oil Filters	6,926	3,967	501	Each
Oil	265,750	164,600	7,500	Litres
Mixed Regulated Waste	7.6	7.1	0.5	Tonne
Sewage (onsite treatment)	559,100	280,000	12,200	Litres
Sewage (offsite treatment)	67,600	20,000	0	Litres

A comparison of the waste generated for 2017 against the waste volumes for the previous 2 years shows a significant decline in volume due to the reduced coal production through the CHPP and mining operations ceasing in September 2016.

6.17.1 General Waste

To assist in the separation of waste at source, designated waste storage areas, such as labelled bins or bunded areas, are in place across the site. Hazardous wastes are contained within bunds which drain into Drayton's pollution control system.

A licenced waste contractor disposes of all waste materials generated on site. Domestic rubbish generated on site is deposited in the Muswellbrook Waste Management Facility. Monthly inventories and reports ensure all waste movements are documented. Management strategies are in place for each of the major waste streams relevant to key work areas.

6.17.2 Recycling Initiatives

Drayton recycles or reuses specific waste streams to minimise the environmental effects of the product. Where possible, waste items are recycled by original equipment manufacturers or certified contractors. Machine batteries; mobile phone and radio batteries; waste oil; grease; empty drums; and scrap metal are removed from site and recycled by a licenced waste contractor. Used printer cartridges are returned to the manufacturer for recycling.

6.17.3 Sewerage Treatment / Disposal

There has been a reduction in demand for waste services as the number of employees during the reporting period has decreased significantly when compared to previous years.

All on-site effluent is treated in Drayton's sewage treatment plant (STP), which is licenced under the EPL. The treated effluent is then distributed into two settlement ponds, and overflow from these ponds is pumped to an area of rehabilitation on the East Tip.

There are several septic tanks on site (e.g. at the CHP and crib huts) which are not connected to the on-site sewerage treatment plant. During the 2017 reporting period, Drayton's waste provider transported 12.2 kL of effluent from these tanks and pumped it into the on-site STP for treatment. EPL 1323 allows 140 kL/day to be discharged to the utilisation area. Visual inspections of the area have not identified any ponding or run-off.

6.18 Public Safety

Drayton offers no public access to any mine working areas. Signage around the mining lease boundary fences has been erected notifying the public not to enter the mine site. This signage was updated and increased during 2012. Boundary gates are kept locked and following cessation of mining in October 2016 an automated security gate was installed on Drayton land to control access to the site from Thomas Mitchell Drive. This gate is closed outside of schedule work start and finish times and persons wishing to gain access to the site are required to contact the OCE or their site contact persons to obtain access. No public access is available to Drayton outside operating hours of 7am – 5pm weekdays. Security personnel are present outside operating times to ensure safety and to provide a contact person in the event of an emergency.

There were no incidents of public safety concerns during 2017.

7 WATER MANAGEMENT

7.1.1 Water Licences

Drayton operates a closed water system and does not draw water from surface water sources (such as the Hunter River), or discharge water to the environment. Drayton does not currently hold any Water Access Licences (WALs) for the extraction of water from the Hunter River or any credits to discharge water in accordance with the Hunter River Salinity Trading Scheme (HRSTS). Accordingly, no water was either extracted from the Hunter River or discharged from Drayton during the 2017 reporting period.

All mine water is contained within the existing operations storages and mining voids for use in coal processing or dust suppression. Water has generally been lost through evaporation or entrainment in tailings, rejects or product coal railed from site, and is recharged from rainfall run off and minimal groundwater interception. There are no significant clean water catchments located on site and therefore no clean water storages are required.

Drayton currently has several Water Licences issued by the NSW Office of Water associated with mining operations (see **Table 25**). Of these, one groundwater licence is for extraction purposes of up to 985 ML per annum (see **Table 26**). This licence requires an annual compliance report which can be found in **Table 27**. An additional licence for a further 402 ML per annum (1,387 ML combined) has been submitted to the NOW and is pending approval.

Table 25: Summary of Drayton Groundwater Licences

Consents, Leases and Licences	Type	Date of Issue	Date of Expiry	Approval Authority
Bore Licence 20BL111869	Production Bore	24/04/2010	23/04/2015*	NSW Office of Water
Bore Licence 20BL171958	Production Bore	23/02/2015	22/02/2020	NSW Office of Water
Bore Licence 20BL171956	Test Bore	27/08/2008	Perpetuity	NSW Office of Water
Bore Licence 20BL171957	Test Bore	27/08/2008	Perpetuity	NSW Office of Water
Bore Licence 20BL171955	Test Bore	27/08/2008	Perpetuity	NSW Office of Water
Bore Licence 20BL171954	Test Bore	27/08/2008	Perpetuity	NSW Office of Water
Bore Licence 20BL171953	Test Bore	27/08/2008	Perpetuity	NSW Office of Water
Hunter River Salinity Trading Scheme (Credit purchase arrangement)	N/A	Nov 1998	No current credits	NSW EPA

** Groundwater license renewal submitted to NSW Office of Water 21/04/2015, license renewal pending.*

Table 26: Groundwater Licences (Extraction)

Consents, Leases and Licences	Type	Entitlement (ML)
Bore Licence 20BL171958	Production Bore	985

Table 27: Groundwater Bore 20BL17958 Compliance Report

Condition Number	Requirement	Comments
2	The licence holder must implement a methodology to the satisfaction of DPI Water to estimate the annual volume of alluvial water inflow (water budget) that the licence holder is likely to extract during the water year. This estimate must be reported annually in the Annual Review.	No water take from the alluvial aquifer is predicted or has occurred at Drayton.
3	The licence holder must include in the Annual Review a map which shows the licenced site and the current areas where mine works have intersected with alluvial sediment.	N/A
4	The licence holder must report in the Annual Review:	
i)	The monitoring results of any with groundwater monitoring with respect to this licence;	See **Section 7.3.3**
ii)	An assessment of compliance with the conditions of this licence	**This Table**
iii)	A summary of new bores or pits constructed during the year	Nil
iv)	The trend graphs for monitoring data collected for each monitoring bore associated with the licenced site.	N/A
v)	A summary of any contingency event (event) that impacted on groundwater during the last reporting period including actions taken to remedy the event and additional monitoring carried out on the event.	Nil
vi)	Provide any recommendations for improvements for the next reporting period.	N/A
5)	An extraction measurement device must be installed and maintained on each extraction device (pump) used for extraction of water under this licence, and such devices must be of a type and standard, and must be maintained in a manner, which is acceptable to DP&I Water	N/A
6)	The licence holder must ensure that the Independent Environmental Audit as required by Condition 6 of Schedule 5 of DA 06_0202 is submitted to DPI Water. The audit must:	The Independent Environmental Audit (AECOM) 2015 considered conditions of this licence.
a)	Assess compliance with the conditions of the licence, including the groundwater monitoring and contingency plan.	
b)	Review actual impacts of the extractions on any aquifers, groundwater dependent ecosystems and any streams in the area.	
c)	Make comparisons between actual and predicted impacts (modelled results)	
d)	Provide recommendations as to works that ought to be performed or additional obligations that ought to be imposed in order to rectify any impacts on groundwater.	
7	DPI Water shall have the right during the currency of this licence to vary at any time the volumetric allocation, or the rate at which this allocation is taken.	Noted
8	The volume of groundwater extracted from the works authorized by this licence shall not exceed 985 megalitres in any 12 month period commencing 1st July.	See **Section 7.3.4**

7.1.2 Water Management System

No changes were made to the mine water management system in the reporting period. The Drayton water management system is a closed system which sources all of its process water internally from within the existing mining operational area with no extraction from the Hunter River. Potable water is supplied by pipeline from Muswellbrook. During 2017 the Drayton water management system consisted of a series of on-site dams and in-pit water storage areas as shown on **Figure N**.

The total storage capacity of the water management system was 36,156 ML at the end of the 2017 reporting period. This consisted of 1,385 ML capacity in major mine water storage dams and 34,771 ML in the voids. Water volumes in major storages are given in **Table 28** below.

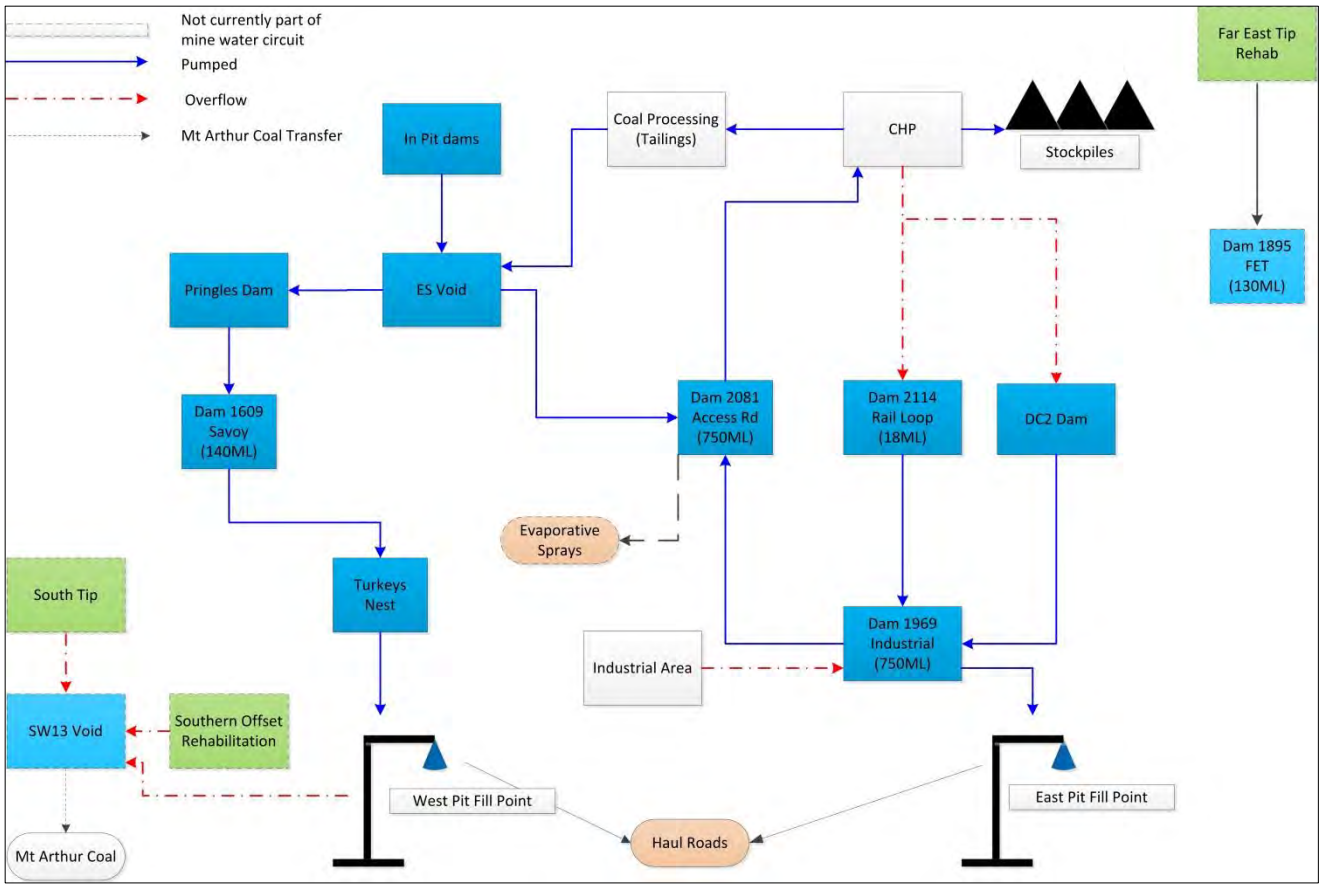


Figure N: Water Management Flow Diagram

Table 28: Stored Water – December 2017

		Volumes held (ML)		
		Start of Reporting Period	End of Reporting Period	Storage Capacity
Clean Water		0.05	0.05	0.05
Mine Water:	**Savoy (1609) Dam**	49.3	11.8	145
	Industrial (1969) Dam	375	398	750
	Access Road (2081) Dam	296	229	615
	Rail Loop (2114) Dam	5	5	18
	Other Surface Dams (transfer dams)	25	25	25
SW13 Void*		590	0	0
NN Pit		31	2110	11,990
ES Void		5,165*	5,483	11,194
SPE Void		1,807	2,350	11,587
Controlled discharge water (salinity trading scheme)		Nil	Nil	Nil
Contaminated Water		Nil	Nil	Nil

** Error in data from 2016 report*

The Far East Tip Dam (Dam 1895) has a capacity of approximately 130 ML however it has no connection with mining activities. This dam exists principally to control runoff (clean water) from the Far East Tip, a rehabilitated out of pit overburden dump. This dam is on land that is owned and managed by AGL.

The Rail Loop Dam (Dam 2114) controls runoff from the CHP area. Water from the Rail Loop Dam is recycled back to the mine water system via the Industrial Dam. The 18 ML capacity of the Rail Loop Dam is maintained as close to zero as possible to prevent potential for offsite discharge of mine water.

Clean water is piped to site for drinking and bathing. The water is stored in a holding tank of 0.05 ML capacity. The tank is maintained at capacity for use as needed.

Historically, Drayton's water balance has remained in surplus. Throughout drought periods, water storage levels have dropped however water storage supplies remained sufficient for planned rehabilitation activities to occur without adverse impacts on operations. Water storage levels in dams and voids are surveyed each month. At the end of 2017, approximately 640 ML was being stored in established dams and 9,940 ML in pit voids. This equates to approximately 47% of available dam storage capacity and approximately 28% of available void storage capacity.

The void storage capacity has increased compared to the reported capacity in 2016. This is due to the previously reported capacity being an operational capacity. As the mine was not operating for the entire 2017 reporting period, the void capacity has been revised to include the entire capacity of the voids to the expected final RL.

There was an error in the volume of water reported in the 2016 AEMR for the ES Void. The volume was reported as approximately 3200 ML at the end of 2016 whereas the actual volume as at the

end of 2016 was approximately 5200 ML. This represents an increase from 28% to 46% of the ES void capacity

Drayton utilises evaporation sprays which allow evaporation of excess water if required.

7.1.3 Water Sources

Drayton is situated in the headwaters of three creek catchments, namely Ramrod Creek, Bayswater Creek and Saddlers Creek. There is no major stream flowing through the mine that requires diversion.

All runoff from disturbed areas is intercepted by dams or by the respective pits. All final tips have associated catchment dams that allow runoff to be collected and suspended solids to settle. During the 2017 reporting period approximately 1,199 ML of runoff from rainfall was captured on site. Any potentially contaminated rainfall runoff from the workshop area is diverted to the Oil Pollution Control (OPC) Dam. The OPC Dam has an oil / water separator in place which removes oil residue from the water runoff prior to it being transferred into the Industrial Dam.

Pit water is a combination of both ground water inflows and surface runoff from the areas within the pit during periods of rainfall.

Table 29 below outlines the main water storages, the source of their water supply and where the water is consumed.

Table 29: Mine water storage dams – Water source and usage

Reference No.	Dam Names	Supply Source	Water Use
1969	Industrial Dam	Runoff from rehabilitated area, industrial areas and East Pit	Haul road dust suppression, industrial wash down water and supply to Access Road Dam
2081	Access Road Dam	Runoff from undisturbed and rehabilitated land and pumping in from Industrial Dam and ES Void	Industrial areas, CHP and fire system
2114	Rail Loop Dam	Runoff from CHP, coal stockpile area and fine rejects settling ponds, and direct pumping from Access Road Dam	Transfer to Industrial Dam
1609	Savoy Dam	Runoff from undisturbed and rehabilitated land, SW Void and ES Void transfer point	Mine water storage or transfer to tanker fill stations
ES Void	East Pit South Void	Tailings and water storage	Water extracted and transferred to Access Road Dam or Savoy Dam
SW13 Void	West Pit Void	Runoff from Southern Offset and excess water during wet weather.	Key storage for Mt Arthur Coal.
SPE Void	South Pit East Void	Final void water storage, water pumped from ES Void.	Mine water storage

7.1.4 Water Consumption

During 2017, total mine water consumption was approximately 110.7 ML. Of this, 106.7 ML consisted of industrial usage mainly through wash-down in the workshop and truck wash bays and approximately 4 ML was sprayed onto haul roads for dust suppression purposes.

During the 2017 reporting period Drayton used 3.14 ML of potable water for drinking, showering and toilets within the mining operation areas.

7.2 Surface Water Monitoring

7.2.1 Management System

Drayton maintains a Water Management Plan, which addresses surface water management and monitoring. As part of water management on site the site water balance is calculated each month using the surveyed storage levels, meter readings and rainfall volumes recorded by the on-site meteorological station.

7.2.2 Monitoring System

As part of the surface water monitoring plan, monthly surface water monitoring is undertaken at eleven locations. These monitoring locations are illustrated in **Figure O**. Most of these dams are mine water dams except for dam 2221, which is located in the Antiene Rural Estate area, and dam 1895 which collects run-off from the Far East Tip and grazed land that is owned and managed by AGL.

Analysis undertaken on the samples collected from the main drainage basins and on-site dams include:

- pH
- Electrical Conductivity (EC)
- Total Dissolved Solids (TDS)
- Suspended Solids (SS)
- Bicarbonates
- Soluble Ions (Sodium, Magnesium, Chloride, Sulphate, Calcium and Potassium)

Figure O: Surface water monitoring sites

7.2.3 Results

During the reporting period Drayton received 530.6 mm of rainfall. Water levels in the main dams generally reduced due to dry conditions and lack of pumping throughout 2017. Water quality monitoring continued as in previous years. The Drayton Mine Extension EA 2007 notes that site water quality is typical of other mines in the area and is moderately saline.

A summary of the results for each surface water monitoring point are discussed below and presented in **Table 30**. Complete results for each monitoring location are provided in **Appendix B.**

Table 30: Average Results of Water Quality Monitoring Locations (2017)

Dam	EC µS/cm	pH	TDS mg/L	Magnesium mg/L	Chloride mg/L	Sulphate mg/L	Sodium mg/L	No. Samples
2081	7186	8.17	6131	503	766	3160	673	12
1895	7028	8.60	4775	381	878	2043	1083	12
1609	8324	8.32	7399	623	864	3852	713	12
1969	6126	8.20	4998	408	647	2601	575	12
2109	7083	7.63	4948	274	1079	1988	1098	12
2114	4376	8.21	3512	250	485	1656	466	12
2221	1502	7.46	965	49	229	285	198	12
SW13	6699	8.11	5867	470	632	3106	594	12
ES Void	7433	8.06	6483	536	767	3533	626	4
OPC Dam	6068	8.45	4799	425	660	2552	582	12
V Notch Weir	12518	8.01	9443	481	1871	4068	1946	12

Far East Tip Dam (1895)

Dam 1895 collects runoff from rehabilitated land and undisturbed areas. Ongoing monitoring of the Far East Tip Dam (1895) has revealed that the water quality in this dam is alkaline. The pH levels have remained reasonably consistent fluctuating between 8.3 and 9.1 throughout the year.

Access Road Dam (2081)

The Access Road Dam (2081) receives water from the ES Void tailings storage and the Industrial Dam. The Access Road Dam had a high turnover of water which was pumped to the CHP prior to cessation of operations. During the reporting period the EC in the Access Road Dam fluctuated between 6620 µS/cm and 8290 µS/cm. The TDS fluctuated between 5120 mg/L and 7020 mg/L.

EPL 1323 requires that monitoring of EC be completed (at least quarterly) in the Access Road Dam at three different depths within the dam – 30 cm, 4m and 8m depth. During the reporting period EC sampling at varying depths was completed in March, June, September and November 2017. Regular monthly quality sampling also continued throughout the reporting period and results are presented in **Table 30**.

In accordance with EPL 1232 Drayton continued monitoring downstream of the Access Road Dam at both the V-Notch Weir and the DS1 groundwater bore though results from DS1 were not obtained at the required monthly frequency, with no results available for January and February 2017. An electric pump and real time flow monitor are installed at a downstream sump and weir to pump any seepage water and water from the adjoining clean catchment into the Access Road Dam as well as monitor flow, if any, at the weir. Results to date have indicated that water flow data collected at the weir corresponds to rainfall intensity and volume. Very little water accumulates in the sump during extended dry conditions and it is possible that the water in the sump reflects a shallow groundwater table at this location.

Stormwater was released from the V Notch Weir for approximately nine hours after an electrical storm produced intense rainfall and a lightning strike damaged the power supply to the pump control cabinet. The situation was exacerbated when hail accumulated in the roadside drainage swale and directed clean stormwater into the sump rather than into the normal stormwater flow path which enters the stream below the V-Notch Weir. Approximately 56,450 litres of water with slightly elevated salinity (ranging from 5288 to 5481 µS/cm) was released.

The V Notch Weir is fitted with an alarm system that sends an SMS when water levels exceed the top pump float switch. During the event it was not possible for the night security to identify the issue as prolonged lightning activity during the night prevented an inspection of the system. The fault was identified at 6am the following morning and electrical repairs were completed immediately. The pump was returned to service by 7:30am. There is a very low likelihood of a recurrence of this failure; however, a diesel pump is in place to allow pumping from the V-Notch Sump in the event of another power supply failure.

Antiene Dam

The Antiene Dam (2221) is located off site in the Antiene rural sub division area. This dam has no connection to mining activities and is monitored for background purposes only. The Antiene Dam was originally a small farm dam and its purpose now is to supply water to native animals. During the reporting period the Antiene Dam showed generally lower results for EC; pH; TDS and soluble ions, in comparison to the mine water dams.

Other Dams

Dam 2114, located within the Drayton rail loop, collects surface runoff from the CHP and returns water to the internal water management system. The majority of sediment was removed from this dam in mid-2017. Water levels fluctuated over the year with a reduction in the volume of water stored during the drier 2nd half of 2017. The complete data for all surface water monitoring locations dams is provided in **Appendix B**.

7.3 Ground Water

7.3.1 Management System

Drayton maintains a Water Management Plan, which addresses groundwater management and monitoring. Groundwater at Drayton is extracted only through infiltration to mine voids. As part of water management on site the volume of inflow groundwater is calculated as part of the site water balance. The 2007 EA predicted that the Permian coal seam aquifer would be impacted by

Drayton's operations. As a result piezometers were established during the exploration drilling program, and subsequently throughout the mining process as further exploration drilling was carried out.

Of the original 33 piezometers used in the EA predictions, all but two had been mined out at the end of 2015. These two piezometers (F1167 and F1168) continued to be monitored on a monthly basis; however, a bailer and rope became jammed in F1168 in December 2017. The equipment could not be retrieved and depth measurements and water sampling of this bore have consequently been discontinued. The Groundwater Impact Statement undertaken as part of the 2007 EA predicted a drop of 25 – 50 m for piezometer F1168 and 10 – 25 m for F1167, from their original levels of approximately 194.40 RL and 190.54 RL respectively. The predicted depth for F1168 by 2017 was between 169 RL and 144 RL, and the average actual RL during 2017 was 157. The predicted depth for F1167 by 2017 was between 180 RL and 169 RL, and the average actual RL during 2017 was 165.

7.3.2 Monitoring System

Drayton monitors a network of 11 piezometers on and off site. As described above, monitoring at one location was discontinued in late 2017 due to a blockage. Standing water levels and water quality are monitored on a monthly basis when access is possible, with water quality analysis being completed six monthly for selected bores and monthly for the bore that is immediately down-gradient from the Access Road Dam. Some piezometers cannot be sampled because they are either dry or contain insufficient water to obtain a sample.

The locations of the current piezometers are shown in **Figure P**.

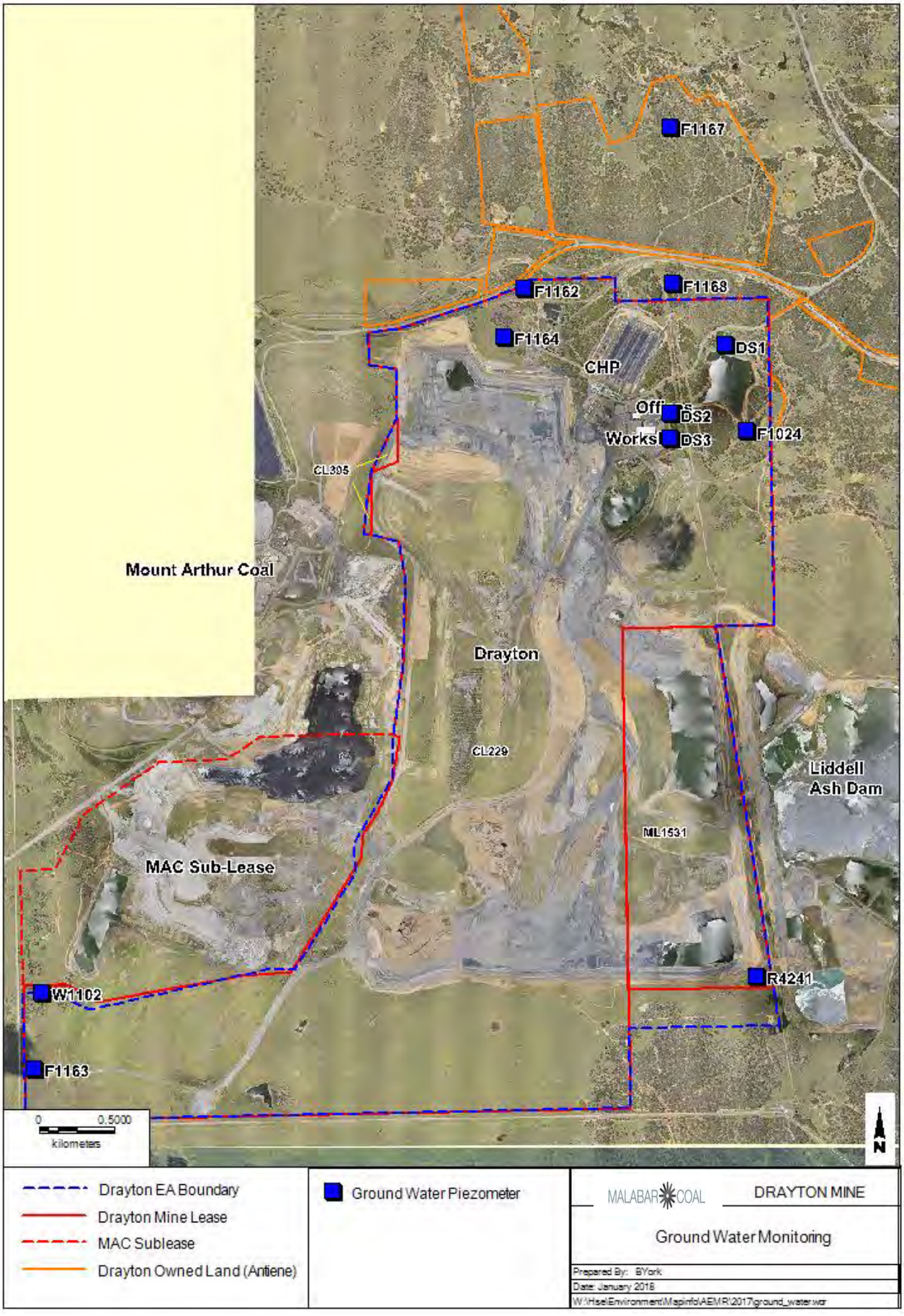


Figure P: Groundwater Monitoring Sites

7.3.3 Results

A summary of the 2017 and long-term piezometer groundwater levels is presented in **Table 31**. The complete results from the 2017 groundwater monitoring program are shown in **Appendix B.**

Piezometer levels from monitoring locations to the south of the mine were generally steady throughout the reporting period. Piezometer R4241 remains in close proximity to the limit of mining in the south. Since the completion of mining in the South Pit East, the adjusted relative level of this piezometer has remained steady.

Piezometer W1102 and F1163 are located to the south-west of the mining lease but are not in close proximity to current operations. W1102 is located near Saddlers Creek and was closest to mining in the south west pit (now SW13 Void), while F1163 is located further to the south of Saddlers Creek. Both of these piezometers have exhibited little change in groundwater levels since monitoring at these locations began in the early 1980s.

Piezometers located in the northern areas of the mining lease generally display a gradual decline in level. Piezometer F1024 was dry throughout 2017, only collecting minor amounts of rainwater runoff and not providing a suitable volume to sample. The water levels in F1162 and F1164, located close to the NN Pit, were too deep to sample during the reporting period. Piezometer F1168, located to the north of the coal stockpiles, displayed a similar level to the previous reporting period up until December, when a bailer became stuck in the bore during sampling.

Piezometer F1167, located in the Antiene area further to the north of the mine, was dry and could not be sampled throughout the reporting period.

Table 31: Summary of Groundwater Levels (2017)

Location	Average Depth 2017 (RL)	No. Of Water Levels Monitored	Long Term Average Depth (RL)	Years of Available Data
F1024^	178.4	11	199.5	1982 – 2017
F1162*	-	11	152.2	1983 – 2017
F1163	177.4	11	177.6	1984 – 2017
F1164*	-	11	160.9	1985 – 2017
F1167	165.1	11	182.5	1986 – 2017
F1168	157.2	11	185.8	1987 – 2017
W1102	177.9	11	178.2	1988 – 2017
R4241	174.4	11	181.5	2005 – 2017

Note: All measurements adjusted with Relative Levels.
*^ Bore dry, no water to sample, *Water levels checked every month (>100m, too deep for equipment to get a standing water level)*

7.3.4 Water Accounting Framework

The Minerals Council of Australia (MCA) has recognised the vital role of water in mining both as an asset that produces value and as a shared natural resource that requires responsible stewardship. To assist its members in managing both of these roles the MCA has, in conjunction with the Sustainable Minerals Institute of the University of Queensland, developed a water accounting framework. Drayton has used this framework.

For the 2017 reporting period, Drayton mine has committed to reporting the *Input-Output Statement* listing flows for all input and output categories for the reporting period, along with the change in the total storage from start-end of the reporting period. **Table 32** details the *Input-Output Statement* for Drayton mine for the reporting period spanning 1st January 2017 to 31st December 2017.

The water balance uses the difference in measured volumes in the dams at the beginning and end of each period (site inventory) and compares it against the difference between the known inputs and outputs for the site (net changes). Inputs and outputs include measured pump meter numbers, simulated rainfall and runoff volumes from mine water storage catchments, evaporation from the water storages, and measured moisture contents for raw and product coal, rejects and tailings transfers. As Drayton mine does not possess a release license, it is considered a closed system and therefore the difference in inventory should equal the net changes. If the numbers are not equal, the difference is considered to be due to groundwater.

During the reporting period, it was calculated that a total of 83 ML of groundwater was intercepted by the north, south and east pits. Whilst mining was being conducted the majority of groundwater was pumped out of the mine workings for safe mining operations to take place, and stored in the ES Void. Since cessation of mining operations water has been allowed to accumulate in each of the voids. The calculated groundwater interception falls well below the groundwater extraction limit of 985 ML authorised by the 20BL171958 water license held by Drayton (see **Section 7.1.1**).

The 2007 EA predicted rate of groundwater inflow at Year 10 is 2.7 ML/day (~981 ML/yr) across the operation. Therefore aquifer interception during 2017 was lower than predicted.

As Drayton is a non-discharge site no groundwater is pumped offsite. The majority of groundwater intercepted on site is stored in the ES void.

Table 32: Drayton Water Accounting Framework Input-Output Statement

INPUT - OUTPUT STATEMENT DATA ENTRY									
	Site Details:	Drayton							
	Reporting Period Detail	Date (dd/mm/yyyy)	Storage (ML)						
	Start	1/01/2017	7774						
	Finish	31/12/2017	8472						
INPUTS-OUTPUTS									
			Water Quality			Sub-element			
Input-Outp	Element (Source/Destination)	Sub-element (Inputs/Outputs)	Category 1 (ML)	Category 2 (ML)	Category 3 (ML)	Total (ML)	Measured, Estimated, Simulated	Accuracy (high, medium, low)	Notes (1,2...)
Inputs	Surface Water	*Precipitation and Runoff*		1,199.0		1,199.0	Simulated	Medium	
		Rivers and Creeks							
		External Surface Water Storage							
	Groundwater	*Aquifer Interception*			83.0	83.0	Estimated	Low	
		Bore Fields							
		Entrainment			0.0	0.0	Measured	Medium	
	Seawater	*Estuary*							
		Sea/Ocean							
	Third Party Water	*Contract*							
		Waste Water							
		Other	3.1				Measured	High	
	TOTAL INPUTS		3.1	1,199.0	83.0	1,285.1			
Outputs	Surface Water	*Discharge*							
		Environmental Flows							
	Groundwater	*Seepage*							
		Reinjection							
	Seawater	*Discharge to Estuary*							
		Discharge to Sea/Ocean							
	Supply to Third Party								
	Other	*Evaporation*	584.4			584.4	Simulated	Medium	
		Entrainment			0.0	0.0	Simulated	Medium	
		Other (potable, misc)	3.1			3.1	Measured	High	
	TOTAL OUTPUTS		587.5		0.0	587.5			

8 REHABILITATION

Drayton has conducted rehabilitation activities since 1983 with a focus on achieving a safe, sustainable and non-polluting landform. The foremost objective of mine rehabilitation at Drayton is to create a landform which is compatible with the surrounding land use practices, is stable in the long term and is capable of a productive post mining land use. Rehabilitation is designed to align with the conservation objectives of the Drayton offset areas as well as those of neighbouring land holders. The objectives of local strategies including the Muswellbrook Shire Council Mining Rehabilitation Policy have been incorporated where possible and the general principles of DRE's 'Synoptic Plan of Integrated Landscapes' have been accounted for in the plan with respect to the creation of wildlife habitat corridors.

8.1 Post Mining Land Use

The Drayton area was traditionally used for beef cattle grazing, so maintaining grazing capacity in pasture areas is a key objective. Another key objective is to maintain ecosystems and biodiversity through the establishment of trees native to the region. Attainment of both goals will result in land that has good grazing potential and high wildlife amenity.

The proposed land capability classifications for the pasture areas ranges from Class IV to Class VI. Class IV and V lands are suitable for well managed grazing, and Class VI and VII lands are not suitable for grazing, but can be used for native woodlands. Post mining rural land capability classification has not yet been assessed for these areas.

Pasture areas continue to exhibit high groundcover establishment levels. Completion criteria based on palatable species establishment, diversity of grazing species and soil characteristics have been developed. Future monitoring will include assessment of these parameters against the completion criteria. Rural land capability classification assessment will be completed for areas where grazing has been identified as the final land use, prior to seeking lease relinquishment completion.

During 2017, the Environment Superintendent completed a review of all previous rehabilitation methodology and objectives in relation to the success criteria identified in the MOP. One outcome from the review may be to adopt direct seeding in lieu of planting to improve establishment rates and achieve a more resilient vegetation community.

It is anticipated that the results from the annual soils and flora and fauna monitoring reports will also assist in providing data that can be used to develop a program of rehabilitation to ensure long term success criteria are achieved.

8.2 Rehabilitation of Disturbed Land

A summary of the total rehabilitation and disturbance for the Drayton Site is outlined in **Table 33**. The proposed rehabilitation target for 2017 was 106 Ha, however, due to delays in mobilisation of a rehabilitation contractor, no new rehabilitation was completed in 2017. No disturbance was undertaken in 2017.

Table 33: Rehabilitation Summary

Mine Area Type	Previous Reporting Period (end 2016) (ha)	This Reporting Period (end 2017) (ha)	Next Reporting Period (forecast end 2018) (ha)
Total Mine Footprint*	1318.2	1318.2	1318.2
Total Active Disturbance**	612.5	612.5	529.5
Land Being Prepared for Rehabilitation	106	0	83
Land Under Active Rehabilitation	705.7	705.7	788.7
Completed Rehabilitation^	86	0	0

**2007 EA Approved Disturbance Boundary. Actual disturbance may be less than stated.*
***Includes Approved Disturbance Boundary less Land Under Active Rehabilitation.*
^No land yet formally signed off by DRE or relinquished.

The rehabilitation status of the Drayton site at the end of 2017 is shown in **Figure Q**, where the extent of mining and rehabilitation activities, surface contours, proposed woodland corridor and rehabilitation vegetation types are represented.

Significant works were undertaken in 2017 to enhance existing rehabilitation areas. These works included cultivation and application of a diverse native woodland seed mix to approximately 47 Ha of land formerly seeded to pasture. This included several areas within the existing woodland corridors where bare patches had been identified during the 2017 flora survey. These areas are still classified as pasture in **Figure Q** as the success of the seeding program will be determined as the trees establish.

Areas proposed to be rehabilitated in 2018 are shown in **Figure R**.

8.3 Land Management Activities

Drayton has also undertaken land management activities during 2017 to enhance the current eco-system establishment within rehabilitated and offset areas. Works undertaken included:

- Weed spraying;
- Fencing repairs/replacement around areas of environmental significance;
- Fire break inspections and slashing;
- Kangaroo culls (for commercial meat harvesting and culling); and,
- Spontaneous combustion remediation.

Figure Q: Drayton Mine Rehabilitation Plan (Dec 2017)

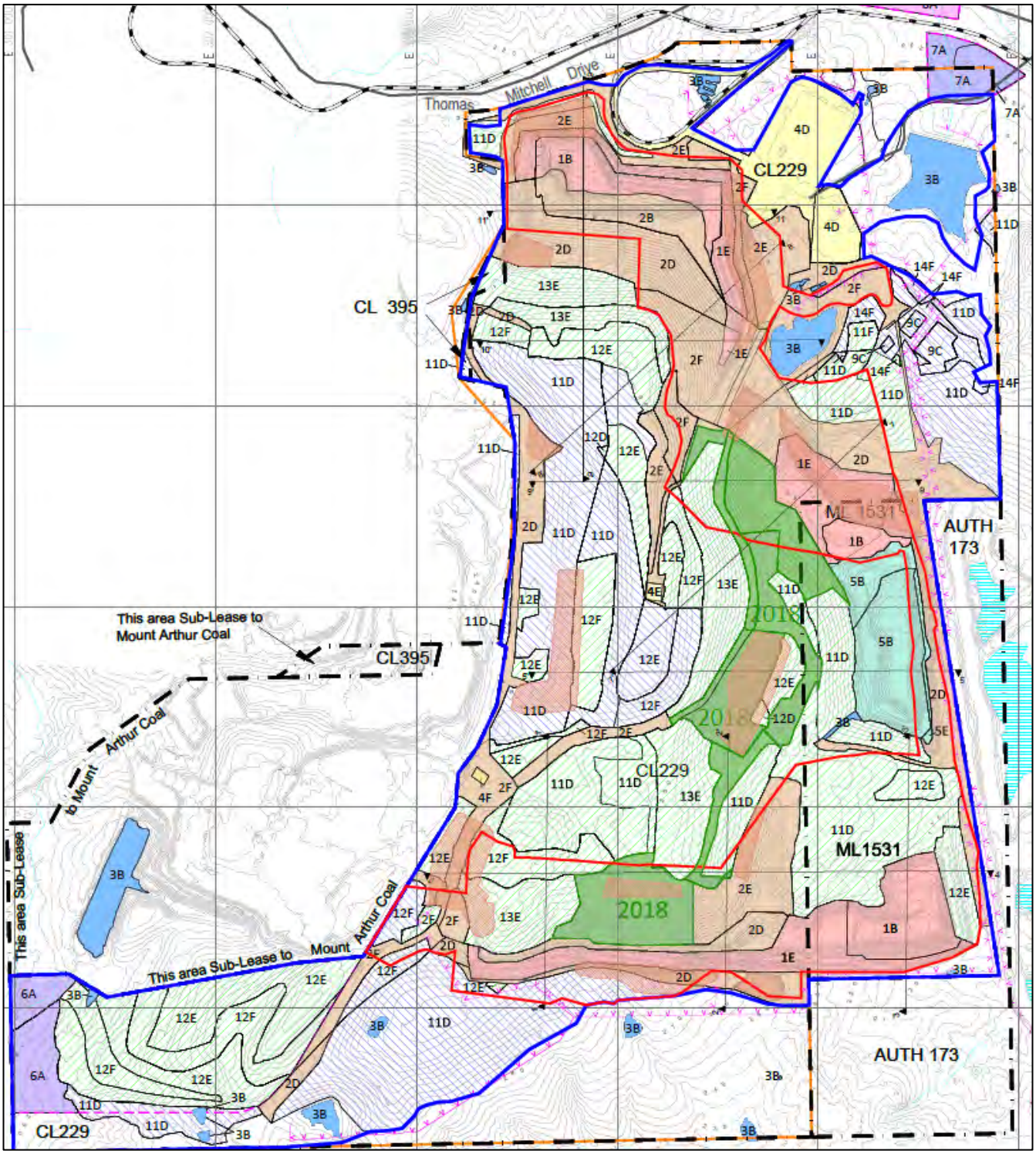


Figure R: Proposed Rehabilitation Areas 2018

8.4 Technical Studies & Evaluations

Studies were also undertaken to address rehabilitation related knowledge gaps. These included:

- Tube stock and direct seeding appraisal to identify preferred vegetation establishment methodology;
- Flora monitoring;
- Fauna monitoring;
- Soils monitoring;
- Evaluation of different Organic Growth Medium products;
- Developed native forest/seed mix for sustainable highwall environments (Geoff Williams, Diversity Seeds);
- Rehabilitation methodology on slopes and seed mix composition (Dr. Mark Burns);
- Site visit and preliminary discussions on adoption of landform Evolution modelling (Prof. Greg Hancock, University of Newcastle)

Other studies that support the site's rehabilitation and closure included:

- Preparation of a detailed decommissioning schedule;
- Preparation of a detailed demolition costing and schedule;
- Contaminated Lands Assessment (Phase 1);
- Spontaneous combustion assessment (Dr. Basil Beamish, B3 Mining);
- Column leach samples of tailings, overburden and fly ash;
- ES Void evaporation monitoring (CSIRO);
- ES Void Risk Assessment (Prof. David Williams, University of Queensland); and,
- Ecotoxicology report for ES void (Dr. Trang Huynh, Hydrobiology).

8.5 Buildings

No buildings are scheduled for removal during the 2015 - 2020 MOP period; however, some buildings may require removal if they are no longer required to support site activities. All buildings undergo routine inspections and maintenance. No buildings were renovated or removed at Drayton during the 2017 reporting period.

Consultation will be with the relevant authorities prior to removal of key infrastructure that is deemed to have potential for use in supporting an alternate final land use.

8.6 Other Infrastructure

No other infrastructure was subject to decommissioning or rehabilitation during the period.

8.7 Further Development of the Final Rehabilitation Plan

Rehabilitation inspections during 2017 assessed risk to rehabilitation areas including competition from weeds, erosion, spontaneous combustion and predation by animals. The 2017 rehabilitation

areas were assessed on a monthly basis for spontaneous combustion using thermal imaging techniques.

Flora and fauna on rehabilitation areas were monitored during 2017 by Eco Logical Australia (ELA). This AEMR has incorporated findings from this assessment.

9 COMMUNITY

Drayton is bounded to the north by Thomas Mitchell Drive, to the south-east by the Liddell and Bayswater power stations and to the west by Mt Arthur Coal. The privately owned, rural-residential land holdings to the north-east of Thomas Mitchell Drive (Antiene Estate) represent Drayton's immediate local community.

Drayton falls entirely within the Muswellbrook Local Government Area (LGA), which represents Drayton's wider local community. The Singleton LGA adjoins the Muswellbrook LGA immediately to the south of Drayton mine.

Active mining and processing operations ceased in October 2016 with the loss of approximately 400 jobs, with only a small project team remaining to oversee the rehabilitation of Drayton. Up until this point Drayton employed approximately 400 permanent employees and engaged contractors to assist in some areas of the operation with over half residing in the local Muswellbrook and Upper Hunter LGSs.

9.1 Social / Economic Contributions and Achievements

Drayton supported a diverse range of projects benefiting the communities of Muswellbrook, Singleton and Upper Hunter LGAs. During the operations phase of the mine contributions were made regularly through application rounds which were advertised in the local papers. Community members belonging to schools and organisations requiring funding for projects, equipment or events were encouraged to apply for funding.

Prior to cessation of coal extraction Drayton was able to support numerous local community projects relating to education and training, health and welfare, sport, arts, culture and heritage, and environment.

Projects Drayton participated in through sponsorship and donations demonstrate the company's commitment to improving social infrastructure for the ongoing benefit of our local communities. 'Giving back' to the local community in which we live and operate is our commitment.

Drayton commenced production in 1983, some key economic information associated with operations include:

- 128Million tonnes of coal mined, processed and delivered to local power stations and export market;
- Up to 530 personnel on site prior to downsizing in 2014
- $409M in direct wages over 5 years (2009 –2013 prior to downsizing in 2014);
- $146M in Royalties over 5 years (2009 –2013 prior to downsizing in 2014); and
- $1,490M total cash costs over 5 years (2009 –2013 prior to downsizing in 2014).

9.2 Environmental Complaints

At any time, the community and other stakeholders can find information on Drayton's environmental management and performance by visiting the Malabar Coal website. The Drayton Environment web page features details of Drayton's approvals, proposed blasting times and environmental management plans. Drayton publishes a monthly update of environmental monitoring data to the web page and this AEMR can also be found there for viewing or download.

Drayton maintains a 24-hour hotline (1800 814 195 or 1800 364 488) for complaints and enquiries as well as provision of a complaints form on the company web page. The hotline allows the community to request and provide feedback about operational activities and lodge complaints on any aspect of the Drayton operations. The hotline number has been advertised in the local newspapers throughout the reporting period and is available on the Malabar Coal website.

An initial call back is provided for all calls to the hotline within 24 hours of the call being received. All complaints are investigated and the details, including any follow-up actions required, are recorded. The community member is notified of the response and/or outcome of the complaint once the investigation has been completed. Complaint information is also discussed at Drayton's Community Consultative Committee meetings (see **Section 9.3**).

Over the past several years, the number of complaints receive has decreased (see **Figure S**). A total of one complaint was received during the 2017 reporting period. This anonymous complaint to the EPA was in relation to an outbreak of spontaneous combustion that was visible from Thomas Mitchell Drive.

Further information on community complaints can be found in **Appendix D**.

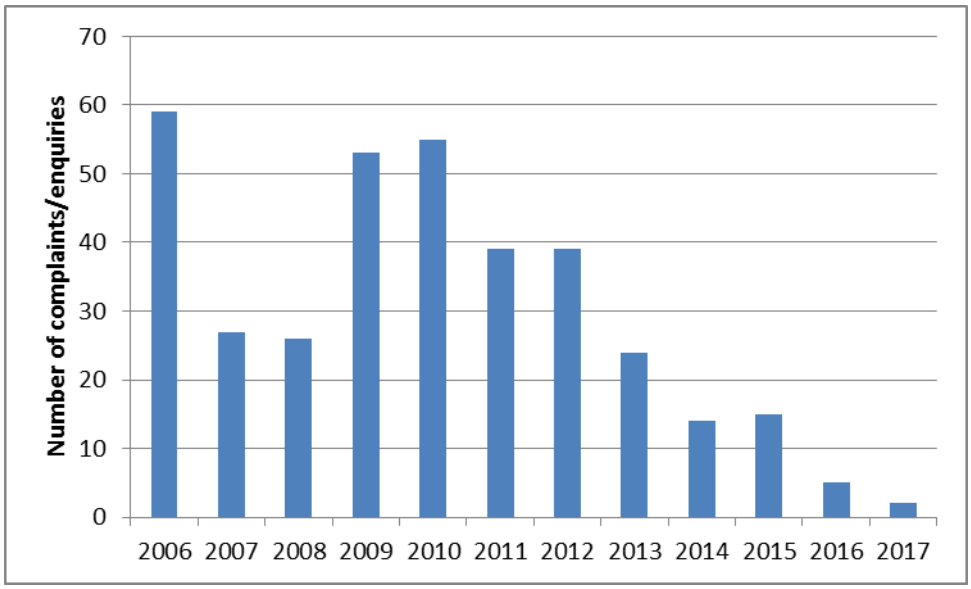


Figure S: Community Complaints/Enquiries Associated with Drayton (2006 – 2017)

9.3 Drayton Community Consultative Committee

Drayton's Community Consultative Committee (CCC) meets quarterly to discuss environmental performance and community issues. Members of this committee consist of local council representatives and near neighbours in addition to the Mine Manager and the Environmental Manager. Drayton also operates, in conjunction with Mt Arthur Coal, a joint CCC where discussions are held regarding the shared Antiene Rail Spur. Members of the joint CCC meet on a six-monthly basis. The joint CCC consists of the members of both operations' individual CCCs.

Key aspects discussed at the CCC meetings include environmental complaints and enquiries, air quality, blasting and vibration, waste management, rehabilitation, project updates and new developments. Throughout the 2017 reporting period, four Drayton CCC meetings were held during the months of March, June, September and December, while two additional joint CCC meetings were held in conjunction with Mt Arthur Coal in June and December. Jennifer Lecky is the Chairperson of the Drayton CCC.

The minutes from the Drayton CCC meetings are published on the Malabar Coal web page.

10 INDEPENDENT AUDIT

Environmental risks associated with the Drayton Operations are recorded in an Environmental Aspects and Impacts Register. The Environmental Aspects and Impacts Register is reviewed on an annual basis and is the basis of the environmental improvement initiatives. The current version of the Aspects and Impacts Register and the EIP are available to site personnel through the document control system. **Table 34** shows the primary aspects of mining for the reporting period rated against a risk matrix.

Condition 6, Schedule 5 of the PA 06_0202 (as modified), and Condition 7.1 of Development Application 106-04-00 requires that every three years an Independent Environmental Audit (IEA) be prepared. Accordingly in late 2015, AECOM Australia Pty Ltd (AECOM) completed the *Independent Environmental Audit Drayton Coal Mine* (2016).

The IEA covered the period between October 2012 and November 2015, and included:

- Conditions of PA 06_0202 (as modified),DA 106-04-00, EPL 1323, CL 229, CL 395, ML 1531 and supporting documents such as environmental management plans;
- An assessment of Anglo Coal's environmental management and performance and the adequacy of relevant environmental management plans at Drayton Coal Mine; and
- A list of recommendations flowing from the findings of this audit.

This audit was conducted by AECOM and included specialists in the fields of air quality, spontaneous combustion, noise and rehabilitation.

The IEA audited over 1,800 conditions associated with the Project Approval, the Environmental Assessments and the relevant management plans. **Table 35** presents a list of the recommendations arising from the IEA and includes a response to how Drayton has addressed each as required.

In accordance with PA 06_0202 (as modified) the next Independent audit will be conducted in 2018.

Table 34: Environmental Risk Review

Aspect	Normal Operations		Abnormal Operations		Shut Down		Emergency	
	Env	Rep	Env	Rep	Env	Rep	Env	Rep
Spontaneous Combustion	18S	8M			18S	13S	8M	
Decommissioning of Mine					18S	9M		
Water Management	8M	8M	8M	8M			9M	9M
Availability of Inert Material	9M		9M		9M		9M	
Management of Topsoil	12M		5L				5L	
Final Void	8M	13S			8M	13S		
Waste Management	4L	2L	2L	2L			2L	
Equipment Noise	8M	4L	8M	5L			3L	
Vibration/Noise from Blasting	12M	12M		8M				

Aspect	Normal Operations		Abnormal Operations		Shut Down		Emergency	
	Env	Rep	Env	Rep	Env	Rep	Env	Rep
Air Quality - Dust	12M	17S	13S					
Groundwater	12M	5L	5L		5L		9M	9M
Sewerage Treatment Plant	5L	5L						
Erosion and Sediment Control	12M	8M			13S	13S	9M	13S
Rehabilitation	12M	8M			17S	13S		
Contaminated Land	4L		7M		7M		4L	
Hydrocarbon Spills	14S	9M	5L		17S	5L	6M	6M
Cultural Heritage	9M	9M	9M	14S	9M	9M	10M	
Light emissions	4L	4L	4L	5L			4L	5L
Greenhouse Gases	11M	5L						
Fauna management	8M	5L	5L	5L			6M	
Flora management	9M	14S					6M	
Uncapped exploration holes	4L				4L			
Coal transport – rail		7M		4L			2L	
Radiation devices	1L							
Weed Infestation	12M	8M			12M	13S		
Feral Animals	8M	8M			8M	8M		

Table 35
2015 Independent Audit Recommendations & Response

Audit Recommendation	Drayton Response
Noise Management Plan	
The methodology of monthly noise reporting should be clarified. *Context: It was considered by the auditor that "The monthly noise monitoring does not appear to be undertaken in accordance with the approved methodology. Noise levels are arbitrarily separated into contributions from different sources, do not appear to be specific to the operations undertaken onsite at the time of measurements, and is not calibrated against measurements taken. Specifically, noise monitoring undertaken by external consultants does not appear to adequately isolate background noise levels from the source noises which are required to be monitored".*	Drayton passed the finding on to the external noise consultant responsible for monthly noise monitoring. The response from the external noise consultant was that the methodology was "developed in coordination with the EPA" and "is the most robust in terms of determining mine noise contribution." The external noise consultant engaged by Drayton is a noise specialist with decades of experience conducting noise monitoring and auditing noise monitoring methodologies. Drayton considers that no further action is required.
Future AEMRs should: • Report the overall noise measurements undertaken by Anglo staff rather than breaking these down based on arbitrarily defined noise contribution sources; and • Reference an annual validation of the noise model.	Drayton accepts the finding in regards to the methodology for supplementary noise monitoring conducted by Drayton staff. As this monitoring is not required for compliance to any consent, lease or licence, and is not required to be reported in the AEMR, future AEMR's will omit data collected during supplementary noise monitoring. Results of compliance monitoring conducted by specialist noise consultants will continue to be reported. An annual validation of the noise model against finding in the 2007 EA will be included in the AEMR (see **Section 6.9.3)**.
Blasting Management and Monitoring Plan	
As some of the responsibilities outlined in the Blasting Management and Monitoring Plan are actually being carried out by different personnel than those nominated in the Plan, it is recommended that the Plan be updated to reflect this.	No Blasting is scheduled at Drayton for some time. The Blasting Management and Monitoring Plan will be again be reviewed prior to any blasting activity taking place.
Improved record keeping of blast rescheduling, blast results and internal blast-level investigations. *Context: The auditor found that explosives quantity does not appear to be recorded as per Engineering Fume Checklist, Pre-blast Checklist and Post-blast Checklist, as well as summary of blast monitoring. Based on the summary of blast monitoring provided to the auditors, there were at least six instances during the audit period (2014 and 2015) where blasts did not have a corresponding pre-shot checklist completed.*	Blast rescheduling happens for various reasons and is not required to be recorded. All blasts are recorded with the date and time they are fired, not when they were scheduled to be fired. Explosive quantity is recorded electronically and in the shot-firer's record books, but has been omitted from blasting checklists. A summary of blast monitoring results is kept electronically in duplicate and reported, both in the monthly monitoring reports available on the website, and in the AEMR's. Internal blast-level investigations are recorded in Enablon (Drayton's incident reporting and investigation system) where appropriate. These investigations do not relate to exceedances. Drayton concludes that current blasting record keeping practices are adequate. The

	checklists will be reviewed to determine if the explosives quantity and blast monitoring results omitted are required to be further duplicated in the checklists, if so, the staff responsible will be trained in completion of the checklists.
Spontaneous Combustion Management Plan	
The Plan should be updated to reference the recent issues the site has had with rehabilitation and the relevant works order from the regulators	The Spontaneous Combustion Management Plan was reviewed 12 September 2017 to address the recommendations
Air Quality Management and Monitoring Plan	
It is recommended that the Air Quality Management Plan be updated to reflect the current practice of E-Sampler trigger levels being used on a one hour average basis rather than a half hour. The Air Quality Management Plan should be updated with the calibrated Trigger Action Response Plan.	The Air Quality Management and Monitoring Plan was reviewed 18 October to reflect current practice and operational status 2017
Water Management Plan	
Incident response procedures within the WMP are to be updated to refer to the immediate reporting requirements under the *Protection of the Environment Operations Act 1997*, and staff are to be made aware of these requirements. Erosion and sediment control be reviewed to confirm compliance with the Managing Urban Stormwater: Soils and Construction Manual (Landcom 2004, or its latest version). The Water Management Plan should be updated so that it refers to the current network of surface and groundwater monitoring locations.	The Water Management Plan was reviewed 29 November 2017 to address the recommendations
It is recommended that the system of post rainfall inspections be reviewed to include rehabilitation areas, sediment and erosion control measures, and the potential for offsite discharge.	The system of post rainfall inspections needs to be reviewed to include a trigger for conducting inspections and a methodology for recording inspections that are completed. The system will then be reviewed to include newly established rehabilitation areas (where vegetation is absent or not well established), sediment and erosion control structures (which may have impaired function after rainfall), and dams with the potential to discharge offsite. These are all inspected regularly but post rainfall inspections are not consistently recorded.
The current water level gauge used at the Access Road Dam should be reviewed to confirm whether the current reading times (once per half hour) are adequate for the site to be able to sufficiently comprehend when a sudden overflow event has occurred.	The water level gauge reading times have been updated to 15-minute intervals.
There is an electrical conductivity result of 22,100 from 21 September 2015, but not indication that this was followed through as it appears to indicate non-compliance with	The result is not a non-compliance. The groundwater monitoring result came from an onsite monitoring location with a baseline high in electrical conductivity.

the site's criteria. However, as this commitment itself is not entirely clear when read in conjunction with the original Groundwater Impact Assessment prepared in 2006, it is recommended that the site confirm what this requirement relates to.	This monitoring location has been installed since the last review of the Water Management Plan. The Water Management Plan is currently under review to incorporate these recommendations.
It is also recommended that future AEMRs include: • Volume (if any) of water supplied to Mt Arthur during the reporting period; • A review against the groundwater model predictions and water usage predictions contained in the environmental assessment; and • A comparison of standing water levels to the steady state calibration results as detailed in the environmental assessment	It should be noted that Drayton does not supply water to Mt Arthur mine. The two mines have an agreement, which expires December 2016, allowing both to store water in a void located near a shared boundary. As at December 2016 no water from Drayton was being placed in the SW13 Void (see **Section 7.3**).
Rehabilitation and Offset Management Plan	
It is recommended that future AEMRs include the following: • Clarification of when rehabilitation works have been undertaken • More details on rehabilitation activities in general including: topsoil application; and annual flora, fauna and spontaneous combustion monitoring, including tracking of any trends identified and survival rates of rehabilitation.	See **Section 8**.
Aboriginal Cultural Heritage Management Plan	
The Aboriginal Cultural Heritage Management Plan (Anglo Coal, October 2008) should be updated to refer to the current status of Aboriginal cultural heritage items that have been preserved offsite or salvaged.	The Aboriginal Cultural Heritage Management Plan was reviewed 4 October 2017 to address the recommendations
It is recommended that the site implement an inspection regime to confirm the condition of Aboriginal cultural heritage items remaining in-situ.	An annual inspection regime has been implemented and outlined in the updated Aboriginal Cultural Heritage Management Plan.
Furthermore it is recommended that future AEMRs: • Clarify whether or not Aboriginal community stakeholder consultation was required during the reporting period, and if not required, specify why; and • Make some comment on the status of any in situ or salvaged Aboriginal cultural heritage items.	See **Section 6.11**.
Environmental Management Strategy	
Incident response procedures are to be updated to refer to the immediate reporting requirements under the *Protection of the Environment Operations Act 1997*, and staff are to be made aware of these requirements.	The Environmental Management Strategy was reviewed 18 October 2017.The site induction has been updated to include the incident response procedures.

The roles and responsibilities outlined in the Appendices to the Environmental Management Strategy should be reviewed for currency	
The site should continue to manage its website to ensure that, in future, all current versions of management plans, AEMRs, previous audit reports and project approvals are available online (it is noted that the 2012 AEMR, several management plans, audit reports, and the DA 106-04-00 was not available at the time of conducting the audit.	The website has been reviewed and updated. The document control system has been updated so that documents that are required to be published on the website are noted.
Environmental Monitoring Program	
The Environmental Monitoring Program should be updated so that refers to the current network of surface and groundwater monitoring locations. The site should reconcile the Environmental Monitoring Program with updates to management plans as and when those updates occur.	The Environmental Monitoring Program was reviewed 10 October 2017 to address the recommendations
Previous IEA 2012	
It is recommended that the Site update its document control process to ensure that when new and revised document are finalised, these are uploaded on the website.	The document control system has been updated so that documents that are required to be published on the website are noted.
It is recommended that the site consider including a short statement in noise monitoring reports (in addition to the tabulated monitoring findings) confirming whether any exceedances were or were not detected during the reporting period.	This recommendation has been passed on to the noise specialist responsible for undertaking monthly monitoring and providing these reports.
General Recommendations	
It is recommended that onsite staff, particularly those in operational and maintenance management roles, be familiarised with the regulatory requirements to notify potential material environmental harm incidents immediately upon becoming aware of them. Furthermore, the site's PIRMP should be updated to reflect the current regulatory requirements of immediate notification to the EPA and other relevant authorities, as the current PIRMP references the old requirement to notify as soon as practicable/within 24 hours.	The site's PIRMP (available on the website) was revised 27 March 2017 to address the recommendations
Certain aspects of the site's environmental management are delegated to other areas of mine management. While the delegation of these matters of environmental management may be appropriate to meet operational needs, it is recommended that there is regular communication between environmental staff and the staff responsible for the day-to-day management of these environmental matters	All staff are responsible for management of day-to-day environmental matters. Environmental staff regularly speak to staff responsible for rehabilitation; water management; dust control; plant maintenance; and various other aspects of environmental management. Apart from daily pre shift briefings and weekly meetings, these discussions are informal and not documented to the satisfaction of the auditors.

It is recommended that the site implement an inspection regime for fences.	There are currently several processes for fence inspections occurring onsite prioritised for site security and stock control. Drayton will introduce a documentation regime.

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

11.1 Environmental Incidents

There was one reportable environmental incidents during the 2017 reporting period. This involved the release of stormwater from the v-notch weir that is located downstream from the Access Road Dam. The release of a small volume of water occurred after lightning damaged the power supply to the pump control panel. This incident didn't result in material environmental harm.

11.2 Environmental Non-Compliances

Internal audits are undertaken to assess compliance against environmental licences and approvals including the development consents, EPL 1323 and Mining Lease conditions. The internal audits identified the following minor non-compliances.

During the Reporting Period the PM_{10} monitoring E-Samplers required for EPL 1323 were subject to intermittent periods of breakdowns. As a result continuous PM_{10} dust readings at these locations was not always possible. Reasons for the breakdowns included power outages, damaged units, invalidated or irregular data and monitors not functioning in accordance with their intended capability i.e. low or irregular air flow. Further, whilst off site undergoing repairs data was unable to be captured during this time.

11.3 Regulatory Enquiries / Correspondence

No official cautions, warning letters, penalty notices or prosecution proceedings were provided or occurred within the 2017 reporting period.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

12.1 Activities in 2018

Drayton is committed to continuously improve the environmental and community performance of operations. Operations during 2018 will provide consideration of changes to the nature and scale of operations being conducted on site, lessons learnt, evolving technologies, government and community feedback and available best practice that may be feasible to the operation. In this regard Drayton's environmental targets for the 2018 reporting period include:

- Maintaining full compliance with environmental legislation including air quality, noise and blast requirements including improvement of the documentation associated with the Environmental Management System.
- Ongoing land management activities such as weed control and wild dog control programs;
- Continued reduction in spontaneous combustion emissions by ongoing improvement in application of the spontaneous combustion management plan;
- Continuation of public involvement and project notifications via the CCC meetings; and,
- Implementation of the approved Mine Rehabilitation Plan including 83 ha of rehabilitation.

13 ADDITIONAL INFORMATION

13.1 Dams Safety Committee Requirements

13.1.1 Liddell Ash Dam

The Liddell Ash Dam Levee (ADL) was constructed to retain ash produced by the Liddell Power Station. The DSC issued Drayton with requirements for monitoring and reporting regarding the ADL.

In 2017 Drayton complied with the DSC requirements by:

- Carrying out an annual independent Type 2 engineering assessment;
- Having tri-weekly inspections conducted by a competent person;
- Completing an annual review of the Ash Dam Management Plan;
- Having an appointed a DSC Liaison Officer;
- Inspecting the ADL after each blast in the notification area;
- Reporting significant changes in seepage to DSC immediately;
- Reporting blast vibrations in excess of 50 mm/s to DSC immediately; and
- Providing monthly reports on:
    - Seepage and pumping rates;
    - ash deposition status;
    - blast monitoring results within the notification area;
    - mining face positions; and
    - compliance statement.

Deposition of ash against the levee in the southern most section of the ADL commenced in mid-March 2015. As predicted, seepage increased significantly when the ash was first deposited. An ash beach is maintained against the wall to seal it and contain the ash but the wall allows seepage of water to assist consolidation of the contained ash. An inspection regime is in place to monitor seepage changes during this period and monthly reports to the DSC continued to inform them of the status of the ADL during 2017

The vibration limit at the ADL for blasting, set by the DSC, is 50 mm/s with all blast results over the limit to be reported immediately to the DSC. Vibration is monitored using two fixed blast monitors located at the crest and toe of the ADL in accordance with DSC requirements. No Blasting was conducted in 2017.

Vibration results from all blasts within the notification area were reported to the DSC in the monthly reports.

An updated Dam Safety Emergency Plan for the ADL was approved by the DSC 16th November 2015.

A Type 2 surveillance inspection is conducted annually and results are reported to the DSC. A geotechnical engineer inspected the dam on 27th July 2016. A Type 2 surveillance report for this

dam was subsequently prepared and submitted to the DSC. Several technical recommendations were made with actions associated with these recommendations tracked in the monthly reports to the DSC.

13.1.2 Access Road Dam

Drayton's main process water storage facility is called the Access Road Dam (2081). This dam is a 13 metre high, significant consequence category, DSC prescribed dam. A Type 3 surveillance inspection is conducted every five years and results are reported to the DSC. A geotechnical engineer inspected the dam on 11th August 2015. A Type 3 surveillance report for this dam was prepared and has since been submitted to the DSC. The report concluded that "the dam and storage together appears to perform as intended. No obvious concerns for the safety of the dam or major operational requirements were noted during this inspection." The report recommended removal of saplings from the bank and spillway which was undertaken during the reporting period. The next report is due in August 2020.

The Access Road Dam is inspected weekly and no stability issues were found during the reporting period. The dam is operated and maintained with adequate freeboard to prevent discharge via the spillway.

APPENDICES

Appendix A: Consents, Leases and Licenses

Table 36: Drayton's Consents, Leases and Licenses

Consents, Leases and Licences	Date of Issue	Date of Expiry	Approval Authority
Licence / Approval Title			
DUAP Conditions re Antiene Rail Spur Development	02/11/2000	02/11/2025	Minister for Planning
PA – Drayton Mine Extension (06_0202)	01/02/2008		Minister for Planning
Modification to Drayton Mine Extension	16/10/2009		Minister for Planning
Modification 2 to Drayton Mine Extension	17/02/2012		Minister for Planning
Lease Conditions			
Exchange of Parts of Coal Lease 229 & Coal Lease 744	25/06/1992		Minister for Mineral Resources and Energy
Coal Lease 395	08/03/2007	Jan 2029	Minister for Mineral Resources and Energy
Renewal of Authorisation 173	12/05/2014		Minister for Mineral Resources and Energy
Mining Operation Plan	01/07/2015	30/06/2020	Division of Resources and Energy (DRE)
Mining Operation Plan - Amendment A (Approved 7th February 2017)	01/07/2015	30/06/2020	Division of Resources and Energy (DRE)
Coal Lease 229	28/05/2003	May 2024	Minister for Mineral Resources and Energy
Mining Lease ML 1531	26/02/2003	Feb 2024	Minister for Mineral Resources and Energy
Ministerial Approval of an Emplacement Area	22/09/2004		Minister for Mineral Resources and Energy
Anglo Sub Lease	29/01/2008		Minister for Mineral Resources and Energy
Ministerial Approval of an Emplacement Area	28/10/2011		Minister for Mineral Resources and Energy
Current Licence Conditions			
Environmental Protection Licence 1323	28/08/2015		NSW Environmental Protection Authority
Bore Licence 20BL111869	24/04/2010	23/04/2015*	NSW Office of Water
Bore Licence 20BL171958	23/02/2015	22/02/2020	NSW Office of Water
Bore Licence 20BL171956	27/08/2008	Perpetuity	NSW Office of Water
Bore Licence 20BL171957	27/08/2008	Perpetuity	NSW Office of Water
Bore Licence 20BL171955	27/08/2008	Perpetuity	NSW Office of Water
Bore Licence 20BL171954	27/08/2008	Perpetuity	NSW Office of Water
Bore Licence 20BL171953	27/08/2008	Perpetuity	NSW Office of Water

Consents, Leases and Licences	Date of Issue	Date of Expiry	Approval Authority
Licence to Store Explosives (XSTR100017)	22/11/2011	08/05/2021	Work Cover NSW
Acknowledgement of Notification of Dangerous Goods on Premises (NDG019387)	04/03/2014	Perpetuity	Work Cover NSW
Hunter River Salinity Trading Scheme (Credit purchase arrangement)	Nov 1998	No current credits	Department Environment & Climate Change (EPA)
Other Agreements			
NPWS Wildlife Refuge	1987		National Parks and Wildlife
Bayswater/Drayton Boundary Licence No 5	02/02/1999		
Licence Agreement for Liddell – Macquarie Generation Water Bores	14/10/1986		Electricity Commission NSW
Agreement to Access & Occupy Property (Water Bores)	04/06/2001		AGL - Macquarie
Agreement to Access & Occupy Property (Far East Tip)	04/06/2001		AGL - Macquarie
Licence Agreement with Muswellbrook Pistol Club	Aug 2001		Drayton Coal Pty Ltd

** Groundwater license renewal submitted to NSW Office of Water 21/04/2015, license renewal pending.*

*** Radiation sources removed from site in 2016.*

Appendix B: 2017 Water Sampling Results

Table 37: 2017 Surface Water Results

Site	Date	Sulphate (SO4)	TDS	TSS	Chloride	Bicarbonate (CaCO3)	Electrical Conductivity	pH	Magnesium	Potassium	Sodium	Calcium
	2017	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm		mg/L	mg/L	mg/L	mg/L
1609	**Jan**	3890	6840	20	858	89	8050	8.16	565	87	672	554
	Feb	4210	8210	12	833	79	8180	8.37	640	114	744	559
	Mar	3730	6730	< 5	814	66	8320	8.49	599	88	640	516
	Apr	3630	7660	8	834	76	7850	8.39	547	89	705	498
	May	2030	4650	5	586	111	5400	7.96	326	41	502	320
	Jun	3570	6030	< 5	858	81	8080	8.33	669	94	610	529
	Jul	3920	7050	< 5	822	87	8170	8.3	631	89	684	535
	Aug	3710	8030	< 5	808	83	8730	8.18	640	91	694	542
	Sep	3660	8440	< 5	875	83	8520	8.42	668	128	770	590
	Oct	4250	8670	< 5	1010	108	9640	8.42	684	115	748	563
	Nov	4440	7840	< 5	964	79	9220	8.32	730	138	821	634
	Dec	5180	8640	< 5	1100	69	9730	8.46	773	122	960	685
	Average	**3852**	**7399**	**11**	**864**	**84**	**8324**	**8.32**	**623**	**100**	**713**	**544**
1969	**Jan**	2600	5250	10	689	120	6100	8.22	365	52	572	369
	Feb	2810	5580	< 5	680	115	6290	8.23	424	59	647	374
	Mar	2260	4280	7	598	72	5640	8.53	339	43	498	306
	Apr	2220	4590	< 5	580	89	5220	8.18	357	38	526	290
	May	3700	6940	10	798	75	7760	8.38	647	88	669	538
	Jun	2280	4530	8	616	124	5680	7.81	393	41	498	323

Site	Date	Sulphate (SO4)	TDS	TSS	Chloride	Bicarbonate (CaCO3)	Electrical Conductivity	pH	Magnesium	Potassium	Sodium	Calcium
	2017	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm		mg/L	mg/L	mg/L	mg/L
1969	**Jul**	2290	3720	5	601	141	5600	7.85	365	44	533	332
	Aug	2280	4850	9	592	157	5960	8.06	360	43	518	336
	Sep	2340	5040	< 5	621	152	5720	8.2	387	54	572	347
	Oct	2960	5180	< 5	552	136	7140	8.33	393	55	581	334
	Nov	2620	5350	< 5	691	128	6110	8.21	420	56	596	356
	Dec	2850	4660	14	741	130	6290	8.34	440	54	694	372
	Average	**2601**	**4998**	**9**	**647**	**120**	**6126**	**8.20**	**408**	**52**	**575**	**356**
2109	**Jan**	1110	2970	22	621	126	4040	7.83	133	11	593	113
	Feb	2690	6460	36	1080	235	7990	7.72	339	24	1350	222
	Mar	309	920	16	202	24	1300	7.24	45	5	156	38
	Apr	880	2540	< 5	581	91	3570	7.53	126	7	498	84
	May	852	2510	< 5	584	77	3570	7.59	123	8	529	94
	Jun	1520	3540	12	948	132	6090	7.35	251	9	874	143
	Jul	2190	4210	< 5	1170	170	7850	7.48	295	12	1180	181
	Aug	2280	6880	< 5	1260	179	9420	7.71	361	13	1430	201
	Sep	2870	8500	< 5	1560	234	10800	7.8	420	16	1730	242
	Oct	2330	5390	< 5	1240	132	8260	7.63	287	14	1100	166
	Nov	3090	6600	18	1540	234	10300	7.86	423	20	1680	231
	Dec	3740	8860	56	2160	326	11800	7.82	482	24	2060	272
	Average	**1988**	**4948**	**27**	**1079**	**163**	**7083**	**7.63**	**274**	**14**	**1098**	**166**
2114	**Jan**	1990	4150	14	545	135	4900	8.25	284	38	458	293
	Feb	2810	5670	12	683	146	6290	8.20	423	54	654	383
	Mar	634	1180	8	166	82	1810	8.10	88	10	151	106

Site	Date	Sulphate (SO4)	TDS	TSS	Chloride	Bicarbonate (CaCO3)	Electrical Conductivity	pH	Magnesium	Potassium	Sodium	Calcium
	2017	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm		mg/L	mg/L	mg/L	mg/L
2114	**Apr**	1130	2840	12	385	155	3510	8.11	187	17	362	183
	May	931	2490	5	332	114	2990	8.16	155	14	304	160
	Jun	1240	2790	5	397	142	3590	8.16	215	14	357	180
	Jul	1680	2880	< 5	464	184	4260	8.18	226	18	448	210
	Aug	1660	3740	5	514	202	4860	8.19	272	18	520	223
	Sep	2080	4450	< 5	630	206	5440	8.35	332	29	666	254
	Oct	1540	2740	< 5	407	103	4290	8.21	193	18	379	161
	Nov	1940	4120	7	591	143	4940	8.33	284	23	562	214
	Dec	2240	5090	12	705	133	5630	8.32	346	33	734	263
	Average	**1656**	**3512**	**9**	**485**	**145**	**4376**	**8.21**	**250**	**24**	**466**	**219**
2221	**Jan**	288	1050	6	266	207	1760	7.87	61	13	233	51
	Feb	348	1420	< 5	333	213	2090	7.85	67	13	317	48
	Mar	363	1020	< 5	228	96	1620	7.67	62	10	194	56
	Apr	259	704	< 5	151	63	1090	7.33	35	10	154	35
	May	226	794	10	170	62	1000	7.36	37	10	130	36
	Jun	227	719	6	167	59	1170	7.16	38	11	140	35
	Jul	233	712	6	165	59	1150	7.22	40	12	144	34
	Aug	231	768	8	179	60	1240	7.25	39	12	150	37
	Sep	269	800	8	192	68	1330	7.21	40	16	169	36
	Oct	292	810	27	208	109	1430	7.5	42	16	175	40
	Nov	323	953	28	265	146	1660	7.54	50	15	208	48
	Dec	356	1830	710	427	410	2480	7.6	80	44	362	72
	Average	**285**	**965**	**90**	**229**	**129**	**1502**	**7.46**	**49**	**15**	**198**	**44**

Site	Date	Sulphate (SO4)	TDS	TSS	Chloride	Bicarbonate (CaCO3)	Electrical Conductivity	pH	Magnesium	Potassium	Sodium	Calcium
	2017	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm		mg/L	mg/L	mg/L	mg/L
1895	**Jan**	2070	5060	8	951	366	7180	8.96	373	28	1150	27
	Feb	2280	5880	8	950	600	7590	8.62	447	39	1240	41
	Mar	1970	4440	10	844	593	7090	8.57	372	27	1030	47
	Apr	2040	4760	< 5	820	538	6320	8.45	329	25	967	49
	May	1670	3930	< 5	777	585	6070	8.37	326	24	963	57
	Jun	1700	3960	6	843	598	6610	8.31	383	22	1020	64
	Jul	2080	3760	< 5	803	642	6690	8.31	372	26	1020	74
	Aug	1720	4990	9	798	647	7140	8.34	374	24	1030	77
	Sep	2020	5320	< 5	872	566	6980	8.55	392	36	1110	82
	Oct	2230	5050	< 5	933	415	7950	8.77	377	30	1010	63
	Nov	2260	5510	< 5	910	388	7200	8.93	396	30	1110	45
	Dec	2470	4640	13	1040	368	7520	9.05	435	31	1340	33
	Average	**2043**	**4775**	**9**	**878**	**526**	**7028**	**8.60**	**381**	**29**	**1083**	**55**
2081	**Jan**	3230	6590	7	787	112	7090	8.05	453	72	638	440
	Feb	3380	6600	11	765	104	7260	8.10	524	84	747	448
	Mar	2910	5160	22	721	58	7030	8.35	455	62	600	386
	Apr	3050	5120	10	734	82	6620	7.74	459	59	648	378
	May	2760	5990	11	706	90	6720	8.06	518	61	658	399
	Jun	2820	6010	10	750	99	6880	7.76	519	57	613	404
	Jul	3150	5390	< 5	720	106	6830	7.96	453	62	665	400
	Aug	2880	6260	6	713	104	7300	8.07	488	61	633	404
	Sep	2620	6440	< 5	757	97	6990	8.43	491	63	656	419
	Oct	3800	6650	< 5	821	67	8290	8.59	541	76	678	407

Site	Date	Sulphate (SO4)	TDS	TSS	Chloride	Bicarbonate (CaCO3)	Electrical Conductivity	pH	Magnesium	Potassium	Sodium	Calcium
	2017	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm		mg/L	mg/L	mg/L	mg/L
2081	**Nov**	3370	7020	< 5	809	60	7460	8.55	545	80	722	444
	Dec	3950	6340	25	903	68	7760	8.42	592	78	823	468
	Average	**3160**	**6131**	**13**	**766**	**87**	**7186**	**8.17**	**503**	**68**	**673**	**416**
SW13	**Jan**	3360	5720	6	680	224	7060	8.16	454	60	600	517
	Feb	3420	6780	< 5	653	215	7130	8.09	508	66	666	531
	Mar	2340	4370	< 5	539	217	5710	8.19	360	43	497	355
	Apr	2750	4670	< 5	562	204	5730	8.22	370	44	556	372
	May	2720	5570	< 5	589	223	5530	8.16	428	46	548	445
	Jun	2880	6070	< 5	626	225	6620	8.06	516	45	520	463
	Jul	3230	4230	< 5	609	215	6650	7.87	462	49	567	490
	Aug	3020	6200	7	597	239	7040	8.02	474	49	582	483
	Sep	3080	6350	5	631	252	6690	8.14	499	65	624	514
	Oct	3510	6480	< 5	680	228	8000	8.32	503	59	600	474
	Nov	3280	6880	< 5	685	218	7090	8.11	522	62	636	518
	Dec	3680	7080	48	728	216	7140	8.03	541	63	728	530
	Average	**3106**	**5867**	**17**	**632**	**223**	**6699**	**8.11**	**470**	**54**	**594**	**474**
OPCD	**Jan**	2670	5110	22	716	191	6350	8.44	410	60	600	359
	Feb	3040	5980	20	728	112	6470	8.86	478	58	632	380
	Mar	1080	1640	9	297	94	2910	8.59	174	23	240	160
	Apr	2660	4880	11	624	123	5690	8.28	370	47	516	320
	May	2460	4160	29	690	298	5440	7.87	446	49	623	369
	Jun	2150	4490	56	585	166	5420	8.01	387	38	487	302
	Jul	2420	4640	62	693	250	6510	8.23	465	50	609	387

Site	Date	Sulphate (SO4)	TDS	TSS	Chloride	Bicarbonate (CaCO3)	Electrical Conductivity	pH	Magnesium	Potassium	Sodium	Calcium
	2017	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm		mg/L	mg/L	mg/L	mg/L
OPCD	Aug	2760	5240	44	704	249	7230	8.24	491	55	663	410
	Sep	3400	7760	9	895	180	8290	8.73	590	90	841	513
	Oct	1340	2570	< 5	324	94	3800	8.47	194	27	263	185
	Nov	3000	5620	12	782	132	7060	8.77	517	72	686	426
	Dec	3640	5500	23	885	111	7640	8.96	579	74	821	464
	Average	**2552**	**4799**	**27**	**660**	**167**	**6068**	**8.45**	**425**	**54**	**582**	**356**
ES Void	Jan	3690	6670	5	792	215	7630	8.12	516	80	616	564
	Feb	*Samples required quarterly*										
	Mar	*Samples required quarterly*										
	Apr	*Samples required quarterly*										
	May	3650	6770	< 5	714	225	7120	8.15	510	75	560	538
	Jun	*Samples required quarterly*										
	Jul	*Samples required quarterly*										
	Aug	*Samples required quarterly*										
	Sep	2910	7030	< 5	733	255	7280	8.04	522	97	623	566
	Oct	*Samples required quarterly*										
	Nov	*Samples required quarterly*										
	Dec	3880	5460	14	829	226	7700	7.94	597	89	704	573
	Average	**3533**	**6483**	**10**	**767**	**230**	**7433**	**8.06**	**536**	**85**	**626**	**560**
V Notch	Jan	4970	11500	< 5	2710	484	15200	8.16	542	23	2520	514
	Feb	5320	14600	< 5	3090	464	19000	8.05	712	33	2950	447
	Mar	2420	5190	14	980	276	7870	7.94	273	15	1090	309

Site	Date	Sulphate (SO4)	TDS	TSS	Chloride	Bicarbonate (CaCO3)	Electrical Conductivity	pH	Magnesium	Potassium	Sodium	Calcium
	2017	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm		mg/L	mg/L	mg/L	mg/L
V Notch	Apr	3520	8710	< 5	1370	346	10200	8.03	370	14	1520	454
	May	3220	6410	< 5	1140	334	9610	8.07	341	14	1400	432
	Jun	2770	6500	7	1070	277	8340	8.11	356	12	1180	393
	Jul	3940	7520	< 5	1320	330	10600	7.95	417	17	1570	507
	Aug	3670	9570	< 5	1340	384	12000	7.9	457	15	1760	505
	Sep	4370	11800	< 5	1980	516	14200	7.91	569	26	2310	520
	Oct	3880	8620	< 5	1730	328	11100	7.98	415	22	1570	394
	Nov	4780	10200	8	2660	515	15300	8.04	616	26	2580	504
	Dec	5950	12700	< 5	3060	513	16800	7.94	701	25	2900	453
	Average	**4068**	**9443**	**10**	**1871**	**397**	**12518**	**8.01**	**481**	**20**	**1946**	**453**

Table 38: 2017 Piezometer Results

Drill Number	Date 2017	Water Level (m)	pH	Electrical Conductivity (µS/cm)	Salinity (ppm)	Total Dissolved Solids (mg/L)
F1024	January	DNS	-	-	-	-
	February	178.2		*Bore dry – unable to sample*		
	March	178.2		*Bore dry – unable to sample*		
	April	177.7		*Bore dry – unable to sample*		
	May	177.7		*Bore dry – unable to sample*		
	June	178.9	7.16	1010	-	656
	July	179.0		*Bore dry – unable to sample*		
	August	178.8		*Bore dry – unable to sample*		
	September	178.7		*Bore dry – unable to sample*		
	October	178.7		*Bore dry – unable to sample*		
	November	178.7		*Bore dry – unable to sample*		
	December	178.1		*Bore dry – unable to sample*		
	Average	**178.4**	**7.2**	**1010**		**656**
F1162	January	DNS	-	-	-	-
	February	-		*Bore too deep for sample*		
	March	-		*Bore too deep for sample*		
	April	-		*Bore too deep for sample*		
	May	-		*Bore too deep for sample*		
	June	-		*Bore too deep for sample*		
	July	-		*Bore too deep for sample*		
	August	-		*Bore too deep for sample*		
	September	-		*Bore too deep for sample*		
	October	-		*Bore too deep for sample*		
	November	-		*Bore too deep for sample*		
	December	-		*Bore too deep for sample*		
	Average					
F1163	January	DNS	-	-	-	-
	February	177.8	7.97	1367	6960	9770
	March	177.7	7.8	7677	3580	9600
	April	177.4	7.15	1722	8340	1210
	May	176.9	7.6	1800	8600	1210
	June	177.4	6.51	1740	-	1130
	July	177.1		*Bore dry – unable to sample*		
	August	177.1		*Bore dry – unable to sample*		
	September	177.6		*Bore dry – unable to sample*		
	October	177.4		*Bore dry – unable to sample*		
	November	177.3		*Bore dry – unable to sample*		
	December	177.4		*Bore dry – unable to sample*		
	Average	**177.4**	**7.4**	**2861**	**6870**	**4584**

Drill Number	Date 2017	Water Level (m)	pH	Electrical Conductivity (µS/cm)	Salinity (ppm)	Total Dissolved Solids (mg/L)
F1164	January	DNS	-	-	-	-
	February	-		*Bore too deep for sample*		
	March	-		*Bore too deep for sample*		
	April	-		*Bore too deep for sample*		
	May	-		*Bore too deep for sample*		
	June	-		*Bore too deep for sample*		
	July	-		*Bore too deep for sample*		
	August	-		*Bore too deep for sample*		
	September	-		*Bore too deep for sample*		
	October	-		*Bore too deep for sample*		
	November	-		*Bore too deep for sample*		
	December	-		*Bore too deep for sample*		
	Average					
F1167	January	DNS	-	-	-	-
	February	163.5		*Bore dry – unable to sample*		
	March	163.6		*Bore dry – unable to sample*		
	April	171.7		*Bore dry – unable to sample*		
	May	171.8		*Bore dry – unable to sample*		
	June	164.5		*Bore dry – unable to sample*		
	July	163.4		*Bore dry – unable to sample*		
	August	163.9		*Bore dry – unable to sample*		
	September	163.5		*Bore dry – unable to sample*		
	October	163.5		*Bore dry – unable to sample*		
	November	163.4		*Bore dry – unable to sample*		
	December	163.5		*Bore dry – unable to sample*		
	Average	**165.1**				
F1168	January	DNS	-	-	-	-
	February	157.4	6.85	1860	1358	9350
	March	157.5	7.32	3290	1650	3850
	April	157.7	6.8	4210	2060	2680
	May	157.7	6.8	4310	2170	2710
	June	157.7	7.46	5280	-	3020
	July	157.7	7.05	5830	3100	-
	August	157.6	7.0	5530	3000	-
	September	157.6	6.98	5410	-	-
	October	157.6	7.05	5780	-	-
	November	157.5	7.41	5810	-	-
	December	153.5		*No sample - bailer stuck in bore*		
	Average	**157.2**	**7.1**	**4731**	**2223**	**4322**

Drill Number	Date 2017	Water Level (m)	pH	Electrical Conductivity (µS/cm)	Salinity (ppm)	Total Dissolved Solids (mg/L)
R4241	January	DNS	-	-	-	-
	February	174.0	6.86	4910	2400	3400
	March	174.0	7.16	4890	2470	3350
	April	174.4	6.75	4820	2440	3450
	May	174.4	6.8	4900	2400	3800
	June	174.4	7.35	5770	-	4300
	July	174.3	6.8	6250	3400	-
	August	174.3	6.84	5820	3100	-
	September	174.3	6.75	5950	3200	-
	October	174.3	6.65	5970	-	-
	November	174.2	6.76	6250	-	-
	December	175.4	6.72	6260	-	-
	Average	**174.4**	**6.9**	**5617**	**2773**	**3660**

W1102	January	DNS	-	-	-	-
	February	178.0	7.00	7630	3670	4890
	March	178.2	7.36	7210	3640	5170
	April	178.3	6.81	7320	3610	4990
	May	178.1	6.7	7800	3800	4900
	June	178.2	7.48	8690	-	7480
	July	178.0	6.96	9180	5100	-
	August	177.4	6.9	8560	4800	-
	September	177.7	6.91	8590	4800	-
	October	177.7	6.91	9010	-	-
	November	177.6	7.32	9480	-	-
	December	177.6	6.93	9110	-	-
	Average	**177.9**	**7.0**	**8416**	**4203**	**5486**

Appendix C: 2017 Dust Sampling Results

Table 39: 2017 Depositional Dust Gauge Results

Site Number	Period	Ash Content (g/m².month)	Combustible Matter (g/m².month)	Total Insoluble Matter (g/m².month)	Total Solids (g/m².month)	Field Note Comments
2197	January	1.9	1.2	3.1	4.3	Dust, leaves, insects
	February	1.9	0.9	2.8	3.4	Insects, dust, pollen
	March	1.5	0.5	2.0	4.8	Insects, dust
	April	1.3	0.6	1.9	2.4	Insects, dust
	May	1.2	0.6	1.8	4.0	Insects, dust, vegetation
	June	1.2	0.3	1.5	1.5	Dust, vegetation
	July	0.5	0.4	0.9	1.5	Dust, insects
	August	1.4	0.4	1.8	2.2	Insects, vegetation, dust
	September	1.7	0.5	2.2	2.2	Vegetation, dust
	October	2.3	1.8	4.1	5.6	Insects, dust, vegetation
	November	1.3	0.8	2.1	2.2	Damaged lid replaced, insects
	December	1.7	1.1	2.8	3.6	Vegetation, dust, insects
	Average	**1.5**	**0.8**	**2.3**	**3.1**	
2230	January	1.9	2.4	4.3	5.9	Spiders
	February	3.0	2.6	5.6	7.5	Spiders, dust
	March	1.0	0.5	1.5	3.6	Insects, dust
	April	1.0	0.3	1.3	2.2	Insects
	May	0.9	0.4	1.3	1.5	Dust, vegetation, insects
	June	1.0	0.1	1.1	1.5	Insects, dust

Site Number	Period	Ash Content (g/m².month)	Combustible Matter (g/m².month)	Total Insoluble Matter (g/m².month)	Total Solids (g/m².month)	Field Note Comments
	July	0.4	0.2	0.6	2.9	Dust, insects
	August	1.2	0.2	1.4	1.5	Insects, dust
	September	2.0	0.7	2.7	2.9	Leaves, dust, insects
	October	1.3	0.7	2.0	2.8	Leaves, insects, dust
	November	1.3	0.6	1.9	2.6	Insects, dust, vegetation
	December	1.5	0.7	2.2	2.8	Vegetation, insects
	Average	**1.4**	**0.8**	**2.2**	**3.1**	
2157	January	1.1	1.4	2.5	4.5	Leaves, insects
	February	1.9	0.9	2.8	3.6	Insects, dust, vegetation (leaves)
	March	0.9	0.3	1.2	1.4	Insects, dust
	April	1.5	0.7	2.2	2.7	Insects
	May	1.1	0.5	1.6	1.9	Dust, insects
	June	1.1	0.3	1.4	1.9	Insects, dust
	July	0.4	0.1	0.5	3.4	Dust, vegetation, insects
	August	1.4	0.1	1.5	1.6	Insects, vegetation
	September	1.4	0.9	2.3	2.9	Leaves, dust, insects
	October	1.2	0.8	2.0	3.2	Leaves, insects, dust
	November	1.3	0.5	1.8	2.4	Insects, dust
	December	1.1	0.6	1.7	2.2	Vegetation, insects
	Average	**1.2**	**0.6**	**1.8**	**2.6**	
2208	January	1.1	0.6	1.7	2.4	Insects, leaves
	February	2.4	0.9	3.3	4.0	Insects, dust

Site Number	Period	Ash Content (g/m².month)	Combustible Matter (g/m².month)	Total Insoluble Matter (g/m².month)	Total Solids (g/m².month)	Field Note Comments
	March	0.6	0.5	1.1	3.7	Insects, dust
	April	1.1	0.4	1.5	3.7	Insects
	May	0.7	0.5	1.2	1.4	Dust, insects, spider
	June	1.0	0.2	1.2	1.8	Insects, dust
	July	0.7	0.3	1.0	1.2	Insects, vegetation
	August	0.7	<0.1	0.7	0.7	Clear
	September	1.2	0.3	1.5	1.9	Insects, dust
	October	1.9	0.8	2.7	3.8	Insects, dust
	November	1.2	0.3	1.5	2.0	Insects, dust
	December	1.4	0.5	1.9	2.3	None
	Average	**1.2**	**0.5**	**1.6**	**2.4**	
2247	January	1.3	1.1	2.4	3.6	Insects, dust, leaves
	February	1.8	0.9	2.7	3.4	Insects, ants, dust, leaves
	March	0.9	0.5	1.4	1.5	Insects, dust
	April	1.3	0.5	1.8	2.8	Insects
	May	1.1	0.4	1.5	1.8	Dust, insects
	June	1.0	0.3	1.3	1.5	Insects, dust
	July	0.6	0.1	0.7	0.8	Insects, dust
	August	1.2	0.3	1.5	1.6	Clear
	September	1.8	0.5	2.3	2.6	Insects, dust
	October	1.6	0.8	2.4	3.1	Insects, dust
	November	1.4	0.7	2.1	2.6	Insects, dust
	December	1.4	1.1	2.5	4.5	Algae, big moth

Site Number	Period	Ash Content (g/m².month)	Combustible Matter (g/m².month)	Total Insoluble Matter (g/m².month)	Total Solids (g/m².month)	Field Note Comments
	Average	**1.3**	**0.6**	**1.9**	**2.5**	
2235	January	2.6	5.0	7.6	11.4	Insects, dust, broken lid *needs new lid next month
	February	2.5	0.9	3.4	3.9	Insects, dust
	March	0.8	0.3	1.1	3.9	Insects, dust
	April	1.8	0.5	2.3	2.8	Insects
	May	1.1	0.4	1.5	1.5	Dust, insects
	June	0.9	0.2	1.1	1.6	Insects, dust
	July	0.5	0.1	0.6	0.8	Insects, dust
	August	1.2	0.2	1.4	1.6	Insects, vegetation
	September	2.0	0.7	2.7	3.1	Insects, dust
	October	2.0	1.2	3.2	4.5	Insects, dust
	November	1.3	0.5	1.8	2.1	Dust, insects
	December	1.6	0.8	2.4	2.6	Insects
	Average	**1.5**	**0.9**	**2.4**	**3.3**	
2175	January	1.1	0.5	1.6	2.1	Insects, dust
	February	2.2	1.0	3.2	3.8	Insects, dust
	March	1.2	0.5	1.7	4.4	Insects, dust
	April	1.2	0.6	1.8	3.1	Insects
	May	1.1	0.5	1.6	1.8	Dust, insects
	June	1.0	0.7	1.7	2.9	Insects, dust
	July	0.4	0.1	0.5	0.8	Insects, dust
	August	1.2	0.2	1.4	1.6	Insects, dust

Site Number	Period	Ash Content (g/m².month)	Combustible Matter (g/m².month)	Total Insoluble Matter (g/m².month)	Total Solids (g/m².month)	Field Note Comments
	September	1.6	0.5	2.1	2.5	Insects, dust
	October	1.3	0.5	1.8	2.5	Insects
	November	1.4	0.6	2.0	2.3	Dust, insects
	December	1.2	1.0	2.2	2.9	Broken lid, insects, vegetation
	Average	**1.2**	**0.6**	**1.8**	**2.6**	

2130	January	0.9	0.6	1.5	2.5	Insects, dust, owl poo in funnel
	February	2.4	1.2	3.6	4.7	Insects, dust
	March	1.1	0.8	1.9	4.0	Insects, dust
	April	1.5	0.7	2.2	2.6	Insects, dust
	May	0.1	0.2	0.3	0.4	Funnel missing, limited sample
	June	0.7	0.3	1.0	1.6	Dust, vegetation
	July	0.4	<0.1	0.4	2.6	Dust, insects
	August	1.2	0.6	1.8	2.2	Insects, dust
	September	1.6	0.5	2.1	2.8	Insects, dust, leaves
	October	1.6	0.6	2.2	3.4	Leaves, insects
	November	1.3	0.5	1.8	2.3	Dust, insects
	December	1.4	1.0	2.4	3.7	Algae, insects
	Average	**1.2**	**0.6**	**1.8**	**2.7**	

Table 40: 2017 TEOM PM_{10} Monitoring Results

TEOM (µg/m³)					
Date	PM10 24Hr Av	Date	PM10 24Hr Av	Date	PM10 24Hr Av
01/01/17	23.4	01/02/17	24.6	01/03/17	6.9
02/01/17	13.2	02/02/17	26.7	02/03/17	12.8
03/01/17	14.8	03/02/17	27.1	03/03/17	12.0
04/01/17	10.9	04/02/17	0.0*	04/03/17	4.3
05/01/17	12.0	05/02/17	14.6	05/03/17	2.9
06/01/17	12.8	06/02/17	17.6	06/03/17	7.9
07/01/17	13.4	07/02/17	29.3	07/03/17	13.7
08/01/17	12.8	08/02/17	11.6	08/03/17	13.1
09/01/17	31.2	09/02/17	16.4	09/03/17	13.8
10/01/17	28.4	10/02/17	23.0	10/03/17	16.3
11/01/17	18.5	11/02/17	36.4	11/03/17	16.4
12/01/17	34.4	12/02/17	46.0	12/03/17	19.3
13/01/17	20.2	13/02/17	23.0	13/03/17	28.3
14/01/17	21.8	14/02/17	20.1	14/03/17	15.8
15/01/17	20.8	15/02/17	18.2	15/03/17	9.0
16/01/17	29.4	16/02/17	23.6	16/03/17	5.3
17/01/17	17.4	17/02/17	35.8	17/03/17	6.6
18/01/17	23.1	18/02/17	15.9	18/03/17	11.4
19/01/17	19.8	19/02/17	19.9	19/03/17	7.9
20/01/17	7.1	20/02/17	16.2	20/03/17	16.7
21/01/17	20.2	21/02/17	29.3	21/03/17	11.6
22/01/17	22.1	22/02/17	13.5	22/03/17	8.5
23/01/17	16.6	23/02/17	28.2	23/03/17	11.5
24/01/17	21.8	24/02/17	37.0	24/03/17	7.6
25/01/17	0.0*	25/02/17	19.3	25/03/17	14.5
26/01/17	0.0*	26/02/17	13.8	26/03/17	16.7
27/01/17	20.4	27/02/17	13.1	27/03/17	14.7
28/01/17	6.3	28/02/17	10.4	28/03/17	22.9
29/01/17	20.5	01/02/17	24.6	29/03/17	14.5
30/01/17	13.1			30/03/17	9.7
31/01/17	15.4			31/03/17	8.9

**Air conditioner unit issues resulting in unreliable data – no valid result*

TEOM (µg/m³)					
Date	PM10 24Hr Av	Date	PM10 24Hr Av	Date	PM10 24Hr Av
01/04/17	13.9	01/05/17	9.2	01/06/17	14.9
02/04/17	12.9	02/05/17	16.7	02/06/17	12.3
03/04/17	9.1	03/05/17	26.1	03/06/17	22.9
04/04/17	8.5	04/05/17	18.6	04/06/17	10.4
05/04/17	8.1	05/05/17	15.8	05/06/17	10.7
06/04/17	9.1	06/05/17	10.0	06/06/17	11.8
07/04/17	10.8	07/05/17	11.4	07/06/17	9.5
08/04/17	13.2	08/05/17	24.8	08/06/17	6.8
09/04/17	9.1	09/05/17	21.8	09/06/17	7.8
10/04/17	37.2	10/05/17	12.0	10/06/17	6.9
11/04/17	18.1	11/05/17	18.4	11/06/17	11.0
12/04/17	12.6	12/05/17	28.5	12/06/17	12.0
13/04/17	13.9	13/05/17	23.3	13/06/17	14.9
14/04/17	17.1	14/05/17	14.3	14/06/17	12.5
15/04/17	17.7	15/05/17	4.9	15/06/17	7.9
16/04/17	22.8	16/05/17	9.2	16/06/17	14.2
17/04/17	29.2	17/05/17	19.2	17/06/17	20.7
18/04/17	20.0	18/05/17	20.6	18/06/17	19.4
19/04/17	18.0	19/05/17	12.3	19/06/17	20.7
20/04/17	16.5	20/05/17	3.3	20/06/17	16.2
21/04/17	21.0	21/05/17	7.4	21/06/17	14.2
22/04/17	11.7	22/05/17	16.9	22/06/17	12.7
23/04/17	11.5	23/05/17	9.0	23/06/17	14.3
24/04/17	21.1	24/05/17	9.3	24/06/17	13.1
25/04/17	13.8	25/05/17	8.0	25/06/17	11.8
26/04/17	2.4	26/05/17	13.3	26/06/17	12.6
27/04/17	8.9	27/05/17	12.5	27/06/17	21.2
28/04/17	14.2	28/05/17	10.7	28/06/17	15.0
29/04/17	10.7	29/05/17	5.3	29/06/17	6.0
30/04/17	17.1	30/05/17	6.1	30/06/17	5.7
		31/05/17	6.5		

TEOM (µg/m³)					
Date	PM10 24Hr Av	Date	PM10 24Hr Av	Date	PM10 24Hr Av
01/07/17	7.3	01/08/17	7.4	01/09/17	17.2
02/07/17	9.2	02/08/17	13.6	02/09/17	15.7
03/07/17	9.2	03/08/17	19.7	03/09/17	20.3
04/07/17	9.3	04/08/17	2.1	04/09/17	14.7
05/07/17	6.3	05/08/17	6.3	05/09/17	14.5
06/07/17	7.1	06/08/17	4.6	06/09/17	15.8
07/07/17	11.3	07/08/17	9.0	07/09/17	12.9
08/07/17	16.8	08/08/17	10.8	08/09/17	13.7
09/07/17	13.3	09/08/17	5.5	09/09/17	16.1
10/07/17	8.8	10/08/17	5.3	10/09/17	20.5
11/07/17	12.7	11/08/17	17.1	11/09/17	17.8
12/07/17	17.3	12/08/17	12.2	12/09/17	13.2
13/07/17	8.1	13/08/17	12.6	13/09/17	39.8
14/07/17	9.7	14/08/17	10.4	14/09/17	14.4
15/07/17	7.8	15/08/17	14.7	15/09/17	10.2
16/07/17	11.1	16/08/17	21.0	16/09/17	14.6
17/07/17	9.0	17/08/17	11.3	17/09/17	20.7
18/07/17	11.1	18/08/17	25.4	18/09/17	15.6
19/07/17	9.9	19/08/17	6.3	19/09/17	20.1
20/07/17	11.7	20/08/17	14.1	20/09/17	22.3
21/07/17	13.0	21/08/17	11.2	21/09/17	13.7
22/07/17	9.4	22/08/17	26.0	22/09/17	16.2
23/07/17	6.8	23/08/17	18.7	23/09/17	22.7
24/07/17	15.0	24/08/17	19.5	24/09/17	38.0
25/07/17	10.6	25/08/17	20.1	25/09/17	44.0
26/07/17	20.6	26/08/17	11.5	26/09/17	32.5
27/07/17	15.2	27/08/17	11.2	27/09/17	39.6
28/07/17	19.9	28/08/17	15.0	28/09/17	33.3
29/07/17	8.0	29/08/17	15.7	29/09/17	23.5
30/07/17	14.8	30/08/17	18.0	30/09/17	21.2
31/07/17	33.7	31/08/17	25.7		

TEOM (µg/m³)					
Date	PM10 24Hr Av	Date	PM10 24Hr Av	Date	PM10 24Hr Av
01/10/17	26.2	01/11/17	20.7	01/12/17	11.9
02/10/17	31.5	02/11/17	26.1	02/12/17	8.6
03/10/17	22.1	03/11/17	23.5	03/12/17	5.1
04/10/17	19.8	04/11/17	17.0	04/12/17	4.8
05/10/17	12.8	05/11/17	6.7	05/12/17	7.9
06/10/17	24.5	06/11/17	8.7	06/12/17	10.9
07/10/17	23.2	07/11/17	14.1	07/12/17	18.4
08/10/17	22.5	08/11/17	9.4	08/12/17	23.5
09/10/17	12.5	09/11/17	14.6	09/12/17	*
10/10/17	31.0	10/11/17	16.7	10/12/17	*
11/10/17	20.1	11/11/17	13.0	11/12/17	*
12/10/17	14.0	12/11/17	17.6	12/12/17	*
13/10/17	28.8	13/11/17	18.4	13/12/17	10.2
14/10/17	18.5	14/11/17	16.6	14/12/17	18.9
15/10/17	9.2	15/11/17	17.8	15/12/17	47.3
16/10/17	16.2	16/11/17	16.3	16/12/17	31.8
17/10/17	19.6	17/11/17	14.2	17/12/17	39.0
18/10/17	16.6	18/11/17	15.0	18/12/17	33.8
19/10/17	14.8	19/11/17	11.9	19/12/17	13.2
20/10/17	9.5	20/11/17	14.6	20/12/17	29.4
21/10/17	15.9	21/11/17	17.5	21/12/17	18.8
22/10/17	14.6	22/11/17	15.0	22/12/17	12.6
23/10/17	8.6	23/11/17	12.0	23/12/17	19.3
24/10/17	10.2	24/11/17	18.7	24/12/17	25.6
25/10/17	9.4	25/11/17	24.2	25/12/17	15.3
26/10/17	26.7	26/11/17	15.1	26/12/17	10.9
27/10/17	10.8	27/11/17	16.6	27/12/17	13.0
28/10/17	10.3	28/11/17	20.0	28/12/17	17.6
29/10/17	12.8	29/11/17	14.3	29/12/17	20.1
30/10/17	19.0	30/11/17	13.0	30/12/17	11.6
31/10/17	16.3			31/12/17	22.7

**Intermittent power issues (circuit breaker tripped twice) - no result*

Table 41: 2017 High Volume Air Sampler Results

LOT 22 HI-VOL AIR SAMPLER (TSP)		
Run Date	Particulate Mass (mg)	TSP ug/m3
06-Jan-17	93.9	60
12-Jan-17	179.6	118
18-Jan-17	118.0	80
24-Jan-17	264.4	88
30-Jan-17	264.4	87
05-Feb-17	144.4	96
11-Feb-17	150.1	102
17-Feb-17	146.9	97
23-Feb-17	138.5	90
01-Mar-17	34.9	22
07-Mar-17	79.6	51
13-Mar-17	133.5	87
19-Mar-17	37.5	24
25-Mar-17	55.8	36
31-Mar-17	49.4	31
06-Apr-17	33.3	21
12-Apr-17	67.6	43
18-Apr-17	68.5	43
24-Apr-17	79.0	50
30-Apr-17	55.5	34
06-May-17	47.3	29
12-May-17	120.3	74
18-May-17	82.8	51
24-May-17	62.8	40
30-May-17	40.0	24
05-Jun-17	57.5	35
11-Jun-17	51.9	32
17-Jun-17	70.0	43
23-Jun-17	69.6	43
29-Jun-17	17.8	11
05-Jul-17	31.3	20
11-Jul-17	58.8	35
17-Jul-17	46.5	29
23-Jul-17	48.5	30
29-Jul-17	48.6	30
04-Aug-17	21.1	13
10-Aug-17	48.1	30
16-Aug-17	68.7	44
22-Aug-17	109.8	68
28-Aug-17	94.9	58
03-Sep-17	109.0	69

LOT 22 HI-VOL AIR SAMPLER (TSP)		
Run Date	Particulate Mass (mg)	TSP ug/m3
09-Sep-17	127.5	79
15-Sep-17	61.2	38
21-Sep-17	96.5	61
27-Sep-17	118.9	76
03-Oct-17	108.6	69
09-Oct-17	75.3	49
15-Oct-17	66.3	42
21-Oct-17	53.5	34
27-Oct-17	48.0	31
02-Nov-17	121.1	77
08-Nov-17	67.5	42
14-Nov-17	82.7	52
20-Nov-17	65.2	41
26-Nov-17	86.5	56
02-Dec-17	74.8	49
08-Dec-17	106.1	69
14-Dec-17	105.2	69
20-Dec-17	126.0	84
26-Dec-17	43.1	27

Appendix D: 2017 Enquiries, Concerns and Complaints

Table 42: List of Enquiries, Concerns and Complaints Received Throughout 2017

Date	Location	Enquiry, Concern OR Complaint	Nature	Outcome
2017				
13/02/2017	Hassell Road, Muswellbrook	Enquiry	Reporting	Enquiry from resident wanting an update to the building inspections completed at his residence. Environmental Superintendent responded on the same day to advise that he would be the replacement for the Environmental Coordinator, that the reports were being prepared and he would get back to him with a further update. Environmental Superintendent also called DP&E to notify them that the reports had been received from the consultant and he would be sending them through today. The applicable report was also provided to the resident.
19/09/2017	Thomas Mitchell Drive, Muswellbrook	Complaint	Spontaneous Combustion	Anonymous complainant could see spontaneous combustion from Thomas Mitchell Drive on Friday 15th September and Sunday 17th September 2017. Complaint received via EPA phone call to Environmental Superintendent on Tuesday 19th September 2017. EPA asked for details of spontaneous combustion in North Pit. Details provided via email 19th September 2017.

Appendix E: Malabar Coal Safety, Health and Environment Risk Matrix

Table 43: Malabar Coal Risk Matrix

Risk Matrix	Hazard Effect/ Consequence				
Loss Type	**1. Insignificant**	**2. Minor**	**3. Moderate**	**4. High**	**5. Major**
(S/H) **Harm to people (safety /health)**	First aid case / Exposure to minor health risk	Medical Treatment case / Exposure to major health risk	Lost time injury / Reversible impact on health	Single fatality or loss of quality of life / Irreversible impact on health	Multiple fatalities / Impact on health ultimately fatal
(EI) **Environmental Impact**	Minimal environmental harm – L1 incident	Material environmental harm – L2 incident remediable short term	Serious environmental harm – L2 incident remediable within LOM	Major environmental harm – L2 incident remediable post LOM	Extreme environmental harm – L3 incident irreversible
(BI/MD) **Business interruption / Material damage and other consequential losses**	No disruption to operation 5% loss of budgeted operating profit / listed assets	Brief disruption to operation 10% loss of budgeted operating profit / listed assets	Partial shutdown / 15% loss of budgeted operating profit / listed assets	Partial loss of operation / 20% loss of budgeted profit / listed assets	Substantial or total loss of operation 25% loss of budgeted profit / listed assets
(L&R) **Legal and regulatory**	Low level legal issue	Minor legal issue: non- compliance and breaches of the law	Serious breach of law: investigation / report to authority, prosecution and/or moderate penalty possible	Major breach of the law: considerable prosecution and penalties	Very considerable penalties & prosecutions. Multiple law suits & jail terms
(R/S/C) **Impact on reputation, social and community**	Slight impact – public awareness may exist but no public concern	Limited impact – local public concern	Considerable impact – regional public concern	National impact – national public concern	International impact - international public attention

Likelihood	Examples	Risk Rating				
5 (Almost Certain)	The unwanted event has occurred frequently: occurs in order of one or more times per year & is likely to reoccur within 1 year	11 (M)	16 (S)	20 (S)	23 (H)	25 (H)
4 (Likely)	The unwanted event has occurred infrequently: occurs in order of less than once per year & is likely to reoccur within 5 years	7 (M)	12 (M)	17 (S)	21 (H)	24 (H)
3 (Possible)	The unwanted event has happened in the business at some time: or could happen within 10 years	4 (L)	8 (M)	13 (S)	18 (S)	22 (H)
2 (Unlikely)	The unwanted event has happened in the business at some time: or could happen within 20 years	2 (L)	5 (L)	9 (M)	14 (S)	19 (S)
1 (Rare)	The unwanted event has never been known to occur in the business: or it is highly unlikely that it will occur within 20 years	1 (L)	3 (L)	6 (M)	10 (M)	15 (S)

Risk Rating	Risk Level	Guidelines for Risk Matrix
21 to 25	High (H)	Eliminate, avoid, implement specific action plans / procedures to manage & monitor
13 to 20	Significant (S)	Proactively manage
6 to 12	Medium (M)	Actively manage
1 to 5	Low (L)	Monitor & manage as appropriate

Appendix F: 2017 Rail Activity Statement

RAIL ACTIVITY STATEMENT

FOR PERIOD 1/1/2017 - 31/12/2017

(Destination for all trains was Port of Newcastle)

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
1-Jan-17		0		5	10	42,929.8	10	42,929.8
2-Jan-17		0		7	14	59,927.6	14	59,927.6
3-Jan-17		0		6	12	51,301.5	12	51,301.5
4-Jan-17		0		7	14	60,028.7	14	60,028.7
5-Jan-17		0		5	10	42,660.1	10	42,660.1
6-Jan-17		0		7	14	59,820.2	14	59,820.2
7-Jan-17		0		5	10	42,493.4	10	42,493.4
8-Jan-17		0		7	14	60,035.8	14	60,035.8
9-Jan-17		0		6	12	51,235.0	12	51,235.0
10-Jan-17		0		5	10	42,329.9	10	42,329.9
11-Jan-17		0		7	14	60,018.4	14	60,018.4
12-Jan-17		0		8	16	68,324.6	16	68,324.6
13-Jan-17		0		7	14	60,102.7	14	60,102.7
14-Jan-17		0		6	12	51,573.1	12	51,573.1
15-Jan-17		0		7	14	59,774.4	14	59,774.4
16-Jan-17		0		7	14	59,658.1	14	59,658.1
17-Jan-17		0		8	16	68,350.9	16	68,350.9
18-Jan-17		0		8	16	67,249.8	16	67,249.8
19-Jan-17		0		7	14	58,956.6	14	58,956.6
20-Jan-17		0		5	10	42,257.4	10	42,257.4
21-Jan-17		0		4	8	35,006.4	8	35,006.4
22-Jan-17		0		7	14	58,818.2	14	58,818.2
23-Jan-17		0		4	8	34,441.9	8	34,441.9
24-Jan-17		0		2	4	17,167.8	4	17,167.8
25-Jan-17		0		4	8	33,793.8	8	33,793.8
26-Jan-17		0		4	8	34,048.8	8	34,048.8
27-Jan-17		0		3	6	25,146.9	6	25,146.9
28-Jan-17		0		3	6	25,004.8	6	25,004.8
29-Jan-17		0		3	6	25,140.4	6	25,140.4
30-Jan-17		0		5	10	41,737.6	10	41,737.6
31-Jan-17		0		4	8	33,569.8	8	33,569.8
1-Feb-17		0		8	16	66,946.8	16	66,946.8
2-Feb-17		0		6	12	50,537.1	12	50,537.1
3-Feb-17		0		4	8	33,769.4	8	33,769.4

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
4-Feb-17		0		5	10	41,619.8	10	41,619.8
5-Feb-17		0		7	14	53,283.7	14	53,283.7
6-Feb-17		0		3	6	25,139.1	6	25,139.1
7-Feb-17		0		4	8	33,392.2	8	33,392.2
8-Feb-17		0		8	16	66,906.0	16	66,906.0
9-Feb-17		0		5	10	41,650.0	10	41,650.0
10-Feb-17		0		6	12	50,128.6	12	50,128.6
11-Feb-17		0		4	8	34,009.2	8	34,009.2
12-Feb-17		0		5	10	42,057.6	10	42,057.6
13-Feb-17		0		7	14	58,686.8	14	58,686.8
14-Feb-17		0		5	10	41,712.2	10	41,712.2
15-Feb-17		0		5	10	41,712.0	10	41,712.0
16-Feb-17		0		7	14	58,241.0	14	58,241.0
17-Feb-17		0		4	8	33,400.6	8	33,400.6
18-Feb-17		0		7	14	58,621.2	14	58,621.2
19-Feb-17		0		5	10	41,180.4	10	41,180.4
20-Feb-17		0		5	10	42,165.7	10	42,165.7
21-Feb-17		0		0	0	0.0	0	0.0
22-Feb-17		0		0	0	0.0	0	0.0
23-Feb-17		0		0	0	0.0	0	0.0
24-Feb-17		0		5	10	41,787.8	10	41,787.8
25-Feb-17		0		5	10	42,139.4	10	42,139.4
26-Feb-17		0		7	14	58,216.1	14	58,216.1
27-Feb-17		0		7	14	58,428.6	14	58,428.6
28-Feb-17		0		3	6	25,269.0	6	25,269.0
1-Mar-17		0		4	8	34,170.0	8	34,170.0
2-Mar-17		0		6	12	50,505.0	12	50,505.0
3-Mar-17		0		6	12	50,274.8	12	50,274.8
4-Mar-17		0		7	14	58,912.6	14	58,912.6
5-Mar-17		0		7	14	58,348.4	14	58,348.4
6-Mar-17		0		3	6	24,986.2	6	24,986.2
7-Mar-17		0		8	16	67,246.0	16	67,246.0
8-Mar-17		0		7	14	59,214.0	14	59,214.0
9-Mar-17		0		7	14	59,512.2	14	59,512.2
10-Mar-17		0		4	8	33,924.6	8	33,924.6
11-Mar-17		0		6	12	51,145.8	12	51,145.8
12-Mar-17		0		9	18	74,956.9	18	74,956.9
13-Mar-17		0		5	10	42,151.8	10	42,151.8
14-Mar-17		0		7	14	58,178.4	14	58,178.4
15-Mar-17		0		10	20	81,807.0	20	81,807.0
16-Mar-17		0		5	10	41,615.6	10	41,615.6

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
17-Mar-17		0		7	14	59,603.0	14	59,603.0
18-Mar-17		0		6	12	51,140.6	12	51,140.6
19-Mar-17		0		8	16	67,949.2	16	67,949.2
20-Mar-17		0		8	16	68,289.8	16	68,289.8
21-Mar-17		0		5	10	43,046.0	10	43,046.0
22-Mar-17		0		0	0	0.0	0	0.0
23-Mar-17		0		0	0	0.0	0	0.0
24-Mar-17		0		7	14	59,713.4	14	59,713.4
25-Mar-17		0		8	16	67,955.2	16	67,955.2
26-Mar-17		0		8	16	68,492.3	16	68,492.3
27-Mar-17		0		8	16	67,773.9	16	67,773.9
28-Mar-17		0		3	6	25,569.4	6	25,569.4
29-Mar-17		0		7	14	59,239.6	14	59,239.6
30-Mar-17		0		3	6	25,451.0	6	25,451.0
31-Mar-17		0		8	16	67,430.9	16	67,430.9
1-Apr-17		0		7	14	58,674.2	14	58,674.2
2-Apr-17		0		9	18	76,513.8	18	76,513.8
3-Apr-17		0		8	16	68,199.2	16	68,199.2
4-Apr-17		0		0	0	0.0	0	0.0
5-Apr-17		0		0	0	0.0	0	0.0
6-Apr-17		0		0	0	0.0	0	0.0
7-Apr-17		0		8	16	68,397.4	16	68,397.4
8-Apr-17		0		7	14	59,762.9	14	59,762.9
9-Apr-17		0		6	12	51,081.6	12	51,081.6
10-Apr-17		0		7	14	59,521.2	14	59,521.2
11-Apr-17		0		7	14	59,563.6	14	59,563.6
12-Apr-17		0		8	16	67,876.8	16	67,876.8
13-Apr-17		0		7	14	59,649.4	14	59,649.4
14-Apr-17		0		8	16	67,775.2	16	67,775.2
15-Apr-17		0		6	12	50,846.8	12	50,846.8
16-Apr-17		0		7	14	59,450.4	14	59,450.4
17-Apr-17		0		8	16	67,734.7	16	67,734.7
18-Apr-17		0		6	12	50,987.8	12	50,987.8
19-Apr-17		0		4	8	33,586.2	8	33,586.2
20-Apr-17		0		7	14	59,752.6	14	59,752.6
21-Apr-17		0		6	12	51,067.9	12	51,067.9
22-Apr-17		0		8	16	68,297.6	16	68,297.6
23-Apr-17		0		6	12	51,160.4	12	51,160.4
24-Apr-17		0		8	16	68,006.0	16	68,006.0
25-Apr-17		0		9	18	77,044.6	18	77,044.6
26-Apr-17		0		7	14	58,507.8	14	58,507.8

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
27-Apr-17		0		7	14	59,200.8	14	59,200.8
28-Apr-17		0		7	14	59,190.6	14	59,190.6
29-Apr-17		0		6	12	50,782.4	12	50,782.4
30-Apr-17		0		5	10	42,406.2	10	42,406.2
1-May-17		0		6	12	50,906.8	12	50,906.8
2-May-17		0		8	16	68,406.6	16	68,406.6
3-May-17		0		7	14	59,904.0	14	59,904.0
4-May-17		0		8	16	68,536.6	16	68,536.6
5-May-17		0		7	14	59,976.6	14	59,976.6
6-May-17		0		10	20	85,260.6	20	85,260.6
7-May-17		0		9	18	76,576.4	18	76,576.4
8-May-17		0		8	16	67,661.2	16	67,661.2
9-May-17		0		8	16	68,029.2	16	68,029.2
10-May-17		0		9	18	76,357.0	18	76,357.0
11-May-17		0		10	20	84,818.2	20	84,818.2
12-May-17		0		10	20	85,035.8	20	85,035.8
13-May-17		0		9	18	76,435.6	18	76,435.6
14-May-17		0		7	14	59,681.0	14	59,681.0
15-May-17		0		8	16	68,162.9	16	68,162.9
16-May-17		0		3	6	25,668.0	6	25,668.0
17-May-17		0		6	12	50,903.6	12	50,903.6
18-May-17		0		8	16	68,511.6	16	68,511.6
19-May-17		0		9	18	77,096.3	18	77,096.3
20-May-17		0		8	16	68,489.6	16	68,489.6
21-May-17		0		8	16	68,495.4	16	68,495.4
22-May-17		0		9	18	76,896.0	18	76,896.0
23-May-17		0		6	12	51,561.2	12	51,561.2
24-May-17		0		8	16	68,478.6	16	68,478.6
25-May-17		0		7	14	59,816.0	14	59,816.0
26-May-17		0		8	16	67,932.8	16	67,932.8
27-May-17		0		7	14	59,617.4	14	59,617.4
28-May-17		0		6	12	44,609.6	12	44,609.6
29-May-17		0		4	8	34,076.2	8	34,076.2
30-May-17		0		5	10	42,399.0	10	42,399.0
31-May-17		0		4	8	33,490.2	8	33,490.2
1-Jun-17		0		5	10	41,159.2	10	41,159.2
2-Jun-17		0		6	12	51,014.4	12	51,014.4
3-Jun-17		0		9	18	76,819.4	18	76,819.4
4-Jun-17		0		5	10	42,535.8	10	42,535.8
5-Jun-17		0		7	14	59,089.4	14	59,089.4
6-Jun-17		0		5	10	42,110.0	10	42,110.0

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
7-Jun-17		0		5	10	42,037.0	10	42,037.0
8-Jun-17		0		9	18	75,829.2	18	75,829.2
9-Jun-17		0		3	6	25,115.7	6	25,115.7
10-Jun-17		0		0	0	0.0	0	0.0
11-Jun-17		0		0	0	0.0	0	0.0
12-Jun-17		0		0	0	0.0	0	0.0
13-Jun-17		0		4	8	34,144.0	8	34,144.0
14-Jun-17		0		9	18	76,064.4	18	76,064.4
15-Jun-17		0		7	14	59,357.4	14	59,357.4
16-Jun-17		0		6	12	50,877.4	12	50,877.4
17-Jun-17		0		8	16	68,602.6	16	68,602.6
18-Jun-17		0		9	18	76,863.6	18	76,863.6
19-Jun-17		0		7	14	59,849.4	14	59,849.4
20-Jun-17		0		7	14	59,579.2	14	59,579.2
21-Jun-17		0		6	12	51,433.2	12	51,433.2
22-Jun-17		0		5	10	42,207.4	10	42,207.4
23-Jun-17		0		10	20	85,019.8	20	85,019.8
24-Jun-17		0		9	18	76,046.0	18	76,046.0
25-Jun-17		0		7	14	59,545.0	14	59,545.0
26-Jun-17		0		5	10	42,741.2	10	42,741.2
27-Jun-17		0		7	14	59,467.4	14	59,467.4
28-Jun-17		0		5	10	42,400.6	10	42,400.6
29-Jun-17		0		4	8	34,122.8	8	34,122.8
30-Jun-17		0		3	6	25,438.2	6	25,438.2
1-Jul-17		0		7	14	58,978.8	14	58,978.8
2-Jul-17		0		4	8	34,115.2	8	34,115.2
3-Jul-17		0		7	14	58,663.0	14	58,663.0
4-Jul-17		0		8	16	67,255.2	16	67,255.2
5-Jul-17		0		6	12	50,557.2	12	50,557.2
6-Jul-17		0		6	12	50,878.2	12	50,878.2
7-Jul-17		0		7	14	59,445.4	14	59,445.4
8-Jul-17		0		9	18	76,333.9	18	76,333.9
9-Jul-17		0		7	14	59,657.0	14	59,657.0
10-Jul-17		0		10	20	85,043.6	20	85,043.6
11-Jul-17		0		2	4	16,982.0	4	16,982.0
12-Jul-17		0		7	14	59,612.2	14	59,612.2
13-Jul-17		0		3	6	25,652.8	6	25,652.8
14-Jul-17		0		6	12	51,165.0	12	51,165.0
15-Jul-17		0		8	16	68,213.8	16	68,213.8
16-Jul-17		0		6	12	51,021.4	12	51,021.4
17-Jul-17		0		5	10	42,640.2	10	42,640.2

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
18-Jul-17		0		4	8	34,001.0	8	34,001.0
19-Jul-17		0		7	14	59,418.8	14	59,418.8
20-Jul-17		0		1	2	8,469.2	2	8,469.2
21-Jul-17		0		2	4	17,074.6	4	17,074.6
22-Jul-17		0		7	14	59,956.4	14	59,956.4
23-Jul-17		0		2	4	16,970.6	4	16,970.6
24-Jul-17		0		3	6	25,877.7	6	25,877.7
25-Jul-17		0		3	6	25,589.0	6	25,589.0
26-Jul-17		0		4	8	34,246.6	8	34,246.6
27-Jul-17		0		3	6	25,452.8	6	25,452.8
28-Jul-17		0		5	10	42,831.6	10	42,831.6
29-Jul-17		0		4	8	34,207.4	8	34,207.4
30-Jul-17		0		5	10	42,772.6	10	42,772.6
31-Jul-17		0		8	16	68,459.2	16	68,459.2
1-Aug-17		0		4	8	34,201.2	8	34,201.2
2-Aug-17		0		3	6	25,435.0	6	25,435.0
3-Aug-17		0		5	10	42,401.6	10	42,401.6
4-Aug-17		0		4	8	34,432.8	8	34,432.8
5-Aug-17		0		7	14	59,937.8	14	59,937.8
6-Aug-17		0		6	12	51,679.9	12	51,679.9
7-Aug-17		0		5	10	42,976.2	10	42,976.2
8-Aug-17		0		5	10	42,649.4	10	42,649.4
9-Aug-17		0		6	12	51,653.6	12	51,653.6
10-Aug-17		0		5	10	43,002.0	10	43,002.0
11-Aug-17		0		1	2	8,563.7	2	8,563.7
12-Aug-17		0		5	10	42,914.5	10	42,914.5
13-Aug-17		0		9	18	77,147.2	18	77,147.2
14-Aug-17		0		3	6	25,636.2	6	25,636.2
15-Aug-17		0		0	0	0.0	0	0.0
16-Aug-17		0		0	0	0.0	0	0.0
17-Aug-17		0		1	2	8,520.2	2	8,520.2
18-Aug-17		0		5	10	42,727.6	10	42,727.6
19-Aug-17		0		3	6	25,601.8	6	25,601.8
20-Aug-17		0		3	6	25,825.0	6	25,825.0
21-Aug-17		0		2	4	17,108.6	4	17,108.6
22-Aug-17		0		3	6	25,679.0	6	25,679.0
23-Aug-17		0		4	8	34,144.0	8	34,144.0
24-Aug-17		0		3	6	25,608.0	6	25,608.0
25-Aug-17		0		4	8	34,144.0	8	34,144.0
26-Aug-17		0		3	6	25,608.0	6	25,608.0
27-Aug-17		0		3	6	25,608.0	6	25,608.0

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
28-Aug-17		0		9	18	76,824.0	18	76,824.0
29-Aug-17		0		5	10	42,680.0	10	42,680.0
30-Aug-17		0		5	10	42,680.0	10	42,680.0
31-Aug-17		0		6	12	51,216.0	12	51,216.0
1-Sep-17		0		4	8	34,144.0	8	34,144.0
2-Sep-17		0		4	8	34,144.0	8	34,144.0
3-Sep-17		0		5	10	42,680.0	10	42,680.0
4-Sep-17		0		6	12	51,216.0	12	51,216.0
5-Sep-17		0		2	4	17,072.0	4	17,072.0
6-Sep-17		0		5	10	42,680.0	10	42,680.0
7-Sep-17		0		5	10	42,680.0	10	42,680.0
8-Sep-17		0		8	16	68,288.0	16	68,288.0
9-Sep-17		0		4	8	34,144.0	8	34,144.0
10-Sep-17		0		4	8	33,562.0	8	33,562.0
11-Sep-17		0		5	10	42,680.0	10	42,680.0
12-Sep-17		0		9	18	76,824.0	18	76,824.0
13-Sep-17		0		6	12	51,216.0	12	51,216.0
14-Sep-17		0		7	14	59,752.0	14	59,752.0
15-Sep-17		0		5	10	42,680.0	10	42,680.0
16-Sep-17		0		8	16	68,288.0	16	68,288.0
17-Sep-17		0		8	16	68,288.0	16	68,288.0
18-Sep-17		0		8	16	68,288.0	16	68,288.0
19-Sep-17		0		8	16	68,288.0	16	68,288.0
20-Sep-17		0		6	12	51,216.0	12	51,216.0
21-Sep-17		0		6	12	51,216.0	12	51,216.0
22-Sep-17		0		4	8	33,932.6	8	33,932.6
23-Sep-17		0		3	6	25,507.1	6	25,507.1
24-Sep-17		0		2	4	17,002.9	4	17,002.9
25-Sep-17		0		7	14	59,341.8	14	59,341.8
26-Sep-17		0		5	10	42,462.6	10	42,462.6
27-Sep-17		0		5	10	42,285.8	10	42,285.8
28-Sep-17		0		6	12	50,756.0	12	50,756.0
29-Sep-17		0		8	16	67,397.4	16	67,397.4
30-Sep-17		0		6	12	50,560.4	12	50,560.4
1-Oct-17		0		6	12	50,680.0	12	50,680.0
2-Oct-17		0		7	14	59,160.6	14	59,160.6
3-Oct-17		0		5	10	42,264.4	10	42,264.4
4-Oct-17		0		4	8	33,733.2	8	33,733.2
5-Oct-17		0		4	8	34,105.8	8	34,105.8
6-Oct-17		0		7	14	59,351.6	14	59,351.6
7-Oct-17		0		7	14	59,090.6	14	59,090.6

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
8-Oct-17		0		5	10	42,227.6	10	42,227.6
9-Oct-17		0		3	6	25,338.8	6	25,338.8
10-Oct-17		0		0	0	0.0	0	0.0
11-Oct-17		0		0	0	0.0	0	0.0
12-Oct-17		0		0	0	0.0	0	0.0
13-Oct-17		0		4	8	33,932.4	8	33,932.4
14-Oct-17		0		5	10	42,108.4	10	42,108.4
15-Oct-17		0		7	14	59,024.8	14	59,024.8
16-Oct-17		0		6	12	50,844.4	12	50,844.4
17-Oct-17		0		4	8	33,870.0	8	33,870.0
18-Oct-17		0		5	10	42,376.8	10	42,376.8
19-Oct-17		0		3	6	25,384.4	6	25,384.4
20-Oct-17		0		6	12	50,768.0	12	50,768.0
21-Oct-17		0		4	8	33,808.6	8	33,808.6
22-Oct-17		0		3	6	25,424.4	6	25,424.4
23-Oct-17		0		3	6	25,324.4	6	25,324.4
24-Oct-17		0		4	8	34,147.2	8	34,147.2
25-Oct-17		0		3	6	25,255.4	6	25,255.4
26-Oct-17		0		6	12	50,650.8	12	50,650.8
27-Oct-17		0		6	12	50,860.9	12	50,860.9
28-Oct-17		0		9	18	76,301.6	18	76,301.6
29-Oct-17		0		6	12	50,690.6	12	50,690.6
30-Oct-17		0		7	14	59,449.0	14	59,449.0
31-Oct-17		0		1	2	8,496.0	2	8,496.0
1-Nov-17		0		7	14	59,593.3	14	59,593.3
2-Nov-17		0		6	12	51,253.7	12	51,253.7
3-Nov-17		0		5	10	43,337.9	10	43,337.9
4-Nov-17		0		3	6	25,784.4	6	25,784.4
5-Nov-17		0		4	8	34,517.3	8	34,517.3
6-Nov-17		0		6	12	51,535.9	12	51,535.9
7-Nov-17		0		6	12	51,522.8	12	51,522.8
8-Nov-17		0		8	16	68,714.3	16	68,714.3
9-Nov-17		0		6	12	51,479.1	12	51,479.1
10-Nov-17		0		7	14	59,904.9	14	59,904.9
11-Nov-17		0		8	16	68,814.0	16	68,814.0
12-Nov-17		0		9	18	77,253.3	18	77,253.3
13-Nov-17		0		6	12	51,511.8	12	51,511.8
14-Nov-17		0		5	10	43,321.3	10	43,321.3
15-Nov-17		0		6	12	52,001.3	12	52,001.3
16-Nov-17		0		5	10	43,915.9	10	43,915.9
17-Nov-17		0		3	6	26,366.6	6	26,366.6

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
18-Nov-17		0		3	6	26,488.2	6	26,488.2
19-Nov-17		0		2	4	12,174.3	4	12,174.3
20-Nov-17		0		0	0	0.0	0	0.0
21-Nov-17		0		0	0	0.0	0	0.0
22-Nov-17		0		0	0	0.0	0	0.0
23-Nov-17		0		0	0	0.0	0	0.0
24-Nov-17		0		3	6	26,292.4	6	26,292.4
25-Nov-17		0		4	8	35,593.8	8	35,593.8
26-Nov-17		0		5	10	43,543.0	10	43,543.0
27-Nov-17		0		6	12	52,499.4	12	52,499.4
28-Nov-17		0		8	16	70,526.2	16	70,526.2
29-Nov-17		0		6	12	52,301.8	12	52,301.8
30-Nov-17		0		4	8	34,971.1	8	34,971.1
1-Dec-17		0		0	0	0.0	0	0.0
2-Dec-17		0		2	4	17,603.8	4	17,603.8
3-Dec-17		0		4	8	35,091.0	8	35,091.0
4-Dec-17		0		7	14	60,588.4	14	60,588.4
5-Dec-17		0		4	8	34,594.0	8	34,594.0
6-Dec-17		0		8	16	70,045.6	16	70,045.6
7-Dec-17		0		6	12	52,541.1	12	52,541.1
8-Dec-17		0		4	8	34,440.4	8	34,440.4
9-Dec-17		0		2	4	17,699.9	4	17,699.9
10-Dec-17		0		7	14	61,383.7	14	61,383.7
11-Dec-17		0		5	10	43,115.8	10	43,115.8
12-Dec-17		0		9	18	76,746.6	18	76,746.6
13-Dec-17		0		8	16	69,953.4	16	69,953.4
14-Dec-17		0		4	8	33,911.2	8	33,911.2
15-Dec-17		0		8	16	70,367.7	16	70,367.7
16-Dec-17		0		8	16	69,814.5	16	69,814.5
17-Dec-17		0		5	10	43,710.8	10	43,710.8
18-Dec-17		0		3	6	25,530.4	6	25,530.4
19-Dec-17		0		3	6	25,989.8	6	25,989.8
20-Dec-17		0		3	6	25,226.7	6	25,226.7
21-Dec-17		0		5	10	41,764.8	10	41,764.8
22-Dec-17		0		5	10	41,516.0	10	41,516.0
23-Dec-17		0		3	6	25,608.0	6	25,608.0
24-Dec-17		0		6	12	51,216.0	12	51,216.0
25-Dec-17		0		0	0	0.0	0	0.0
26-Dec-17		0		0	0	0.0	0	0.0
27-Dec-17		0		5	10	42,680.0	10	42,680.0
28-Dec-17		0		7	14	60,543.3	14	60,543.3

	Drayton			Mt Arthur Coal			Total Rail Activity	
Date	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Trains / day	Total Train Movements/ day	Total tonnage/ day	Total Train Movements / day	Total Tonnage/ day
29-Dec-17		0		6	12	52,569.6	12	52,569.6
30-Dec-17		0		2	4	17,548.5	4	17,548.5
31-Dec-17		0		5	10	43,629.7	10	43,629.7

PERIOD SUMMARY				
Maximum train movements / day (Drayton)		0	Limit	12
Maximum train movements / day (MAC)		20	Limit	No limit
Maximum combined train movements		20	Limit	30
Total Tonnes (Drayton)	0		Tonnes	
Total Tonnes (Mt Arthur Coal)	16,792,865.7		Tonnes	
Combined Tonnes (Antiene Rail Spur)	***16,792,865.7***		Tonnes	

Appendix G: Rehabilitation Species Composition

Table 44 Native Species Seed Mix - Woodland Rehabilitation 2017

Species	Rate (kg/ha)
Acacia decora	0.3
Acacia decurrens	0.5
Acacia falcata	0.5
Acacia implexa	0.2
Acacia parvipinnula	0.2
Acacia salicina	0.3
Allocasuarina luehmannii	0.1
Dodonaea viscosa	0.1
Bursaria spinosa	0.2
Corymbia maculata	1.3
Daviesia ulicifolia	0.1
Dianella caerulea	0.1
Enchylaena tomentosa	0.1
Eucalyptus blakelyi	0.4
Eucalyptus crebra	1.0
Eucalyptus fibrosa	0.5
Eucalyptus moluccana/albens	0.8
Eucalyptus tereticornis	0.4
Hardenbergia violacea	0.1
Lomandra filiformis or multiflora	0.1
Microlaena stipoides	0.1
Pultenaea spinosa	0.1
Themeda australis	0.1
	7.6
Echinochloa sp.	5
Secale sp.	1
Cynodon dactylon	1
Total seed	**14.6**
rate/cost/Ha	
Extras	
seed heat treatment, smoke treatment or scarification (species highlighted green)	
bulking agent	*7.4*

Native Species Seed Mix – Alternate Woodland Rehabilitation 2017

Species	Rate (kg/ha)	Species	Rate (kg/ha)
dominant trees		**forbs and subshrubs**	
Corymbia maculata	0.3	Atriplex semibaccata	0.1
Eucalyptus blakelyi	0.2	Calotis spp.	0.1

Eucalyptus crebra	0.3	Einadia spp.	0.2
Eucalyptus dealbata	0.1	Enchylaena tomentosa	0.3
Eucalyptus dwyeri	0.1	Solanum cinereum	0.2
Eucalyptus fibrosa	0.1	Swainsona galegifolia	0.2
Eucalyptus macrorhyncha	0.1	Vittadinia spp.	0.4
Eucalyptus punctata	0.3		
		grasses	
sub-dominant trees		Aristida spp.	0.5
Acacia binervata	0.2	Austrodanthonia spp.	0.5
Acacia crassa	0.05	Austrostipa scabra	0.5
Acacia doratoxylon	0.2	Bothriochloa macra	0.5
Acacia implexa	0.1	Chloris truncata	0.5
Acacia lineariifolia	0.1	Cymbopogon refractus	0.1
Allocasuarina verticillata	0.1	Dicanthium setaceum	0.1
Callitris endlicheri	0.25	Panicum spp.	0.2
		Sporobolus creber	0.1
shrubs		Themeda triandra	1
Acacia amblygona	0.1		
Acacia buxifolia	0.1	**extras**	rate kg/Ha
Acacia cultriformis	0.1	cover crop Jap Millet	5
Acacia falcata	0.1	cover crop couch	1
Acacia spectabilis	0.2	bulking agent	6
Acacia penninervis	0.2		
Acacia triptera	0.1		
Cassinia arcuata	0.2		
Dodonaea viscosa subsp cuneata	0.2		
Hardenbergia violacea	0.1		
Indigofera australis	0.1		
Jacksonia scoparia	0.1		
Kunzea ambigua	0.1		
Ozothamnus diosmifolius	0.3		

Table 45 Pasture Species Mix

Species	Kg/Ha	Species	Kg/Ha
Millet (summer)	**40**	**Oats (winter)**	**40**
Ryegrass	**4-5**	**White Clover**	**2-5**
Lucerne	**5-10**	**Vetch**	**2-5**
Couch	**5**	**Medic**	**2-5**
Panic	**2**	**Croplift 15 (fertilizer)**	**100-250**
Kikuyu	**0-3**		

Appendix H: 2017 Attended Noise Monitoring Results

(refer attached report)

10 February 2017

Ref: 03012/6948

Jason Martin
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: JANUARY 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Tuesday 10th January 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

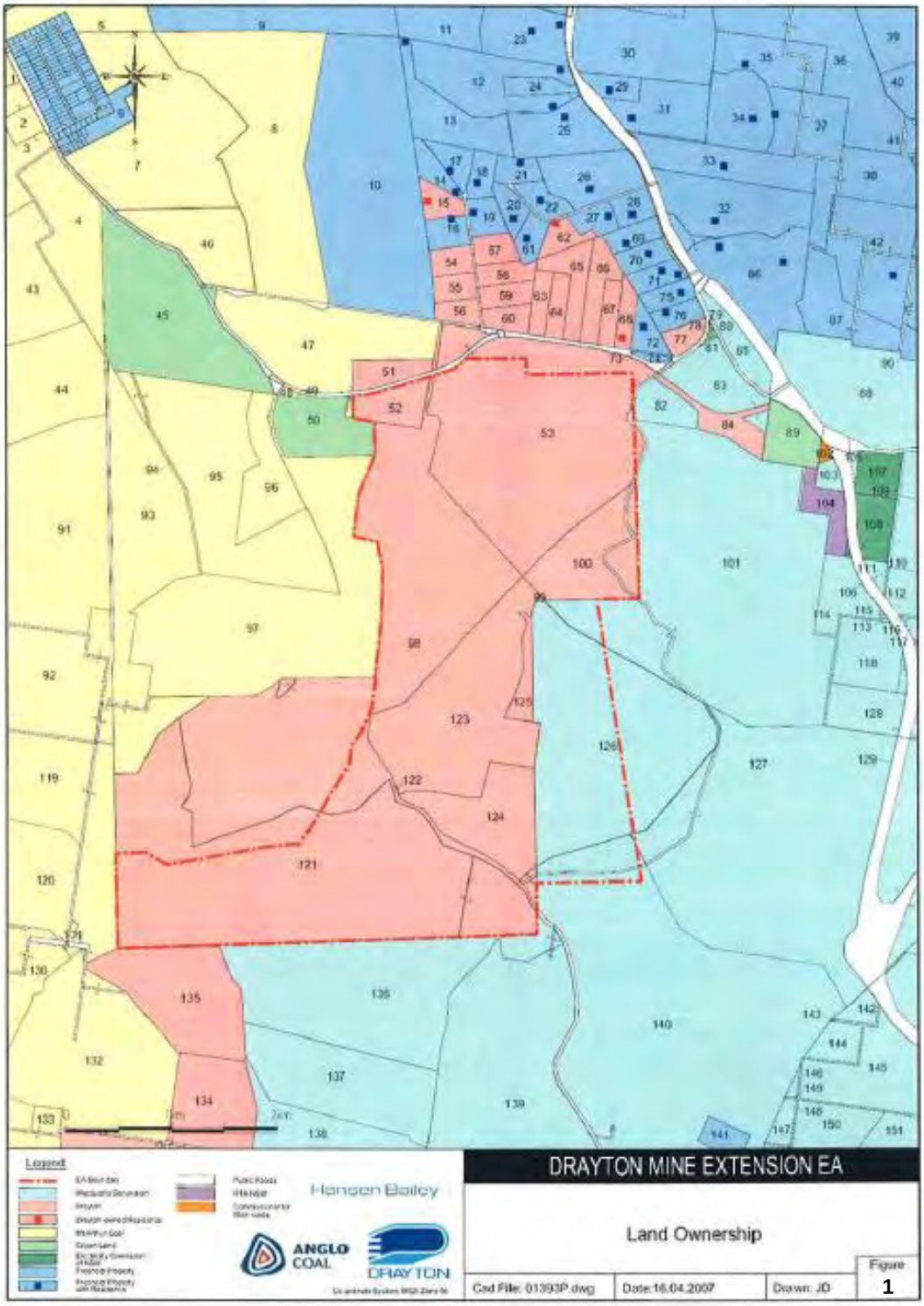
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not reasonable to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Two sets of measurements were made over the "circuit", one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were inaudible at all monitoring locations throughout the evening and night time periods.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date:16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey.

Table 2
DCM Noise Monitoring Results – 10 January 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	6:00 pm	40	0.9/261	Birds (38), traffic (35), **DCM inaudible**
Kerr (37)	7:47 pm	49	2.1/121	Traffic (46), birds & insects (46), **DCM inaudible**
Skinner (40)	7:26 pm	50	2.1/123	Birds & insects (50), traffic (30), domestic (26), **DCM inaudible**
Robertson (37)	6:22 pm	56	1.0/290	Traffic (56), birds & insects (43), **DCM inaudible**
Sharman (35)	7:03 pm	60	2.7/151	Traffic (58), birds & insects (55), **DCM inaudible**
Horder (36)	6:42 pm	46	0.4/321	Birds & insects (45), traffic (38), **DCM inaudible**
Wilson (35)	8:09 pm	50	2.0/128	Insects (50), traffic (34), **DCM inaudible**
Smith (35)	8:32 pm	49	1.6/1.6	Insects (49), traffic (31), **DCM inaudible**

Table 3 DCM Noise Monitoring Results – 10/11 January 2017 (Night)				
Location (Criterion)	**Time**	**dB(A), $L_{eq(15min)}$**	**Wind speed/ direction**	**Identified Noise Sources**
Doherty (39)	12:08 am	41	0.4/255	Insects (41), traffic (28), other mine (26), **DCM inaudible**
Kerr (37)	11:24 pm	42	0.8/251	Traffic (41), frogs & insects (32), other mine (28), **DCM inaudible**
Skinner (39)	11:02 pm	45	0.9/313	Frogs & insects (45), other mine (30), traffic (28), **DCM inaudible**
Robertson (42)	12:30 am	53	0.4/258	Insects (51), traffic (49), other mine (23), **DCM inaudible**
Sharman (41)	12:50 am	48	1.0/280	Insects (45), traffic (45), **DCM inaudible**
Horder (42)	11:47 am	42	1.0/289	Frogs & insects (40), traffic (38), other mine (24), **DCM inaudible**
Wilson (36)	1:12 am	54	1.7/308	Insects (54), traffic (42), **DCM inaudible**
Smith (36)	1:35 am	46	1.2/291	Insects (46), traffic (29), **DCM inaudible**

Table 4 DCM Noise Monitoring Results – 10/11 January 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (47)	12:08 am	47	0.4/255	Insects	n/a
Kerr (47)	11:24 pm	53	0.8/251	Highway	n/a
Skinner (47)	11:02 pm	52	0.9/313	Insects	n/a
Robertson (47)	12:30 am	61	0.4/258	Traffic	n/a
Sharman (47)	12:50 am	56	1.0/280	Highway	n/a
Horder (47)	11:47 am	47	1.0/289	Traffic	n/a
Wilson (47)	1:12 am	57	1.7/308	Insects	n/a
Smith (47)	1:35 am	50	1.2/291	Insects	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emissions were inaudible at all receiver locations.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

As DCM was inaudible, there are applicable tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

As DCM operations were inaudible at all monitoring locations it can be extrapolated that DCM was inaudible at all receiver locations listed in the DCM Project Approval.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington
Acoustical Consultant

Review:

Ross Hodge
Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)				
Location	Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal
34	Inaudible	35	Inaudible	39
29	Inaudible	35	Inaudible	36
31	Inaudible	35	Inaudible	37
33	Inaudible	35	Inaudible	38
86	Inaudible	35	Inaudible	38
32	Inaudible	35	Inaudible	40
71	Inaudible	35	Inaudible	41
75*	Inaudible	35	Inaudible	41
70	Inaudible	36	Inaudible	41
76*	Inaudible	36	Inaudible	42
28	Inaudible	37	Inaudible	40
69	Inaudible	37	Inaudible	41
13	Inaudible	36	Inaudible	35
12	Inaudible	36	Inaudible	36
25*	Inaudible	37	Inaudible	37
26	Inaudible	37	Inaudible	38
27	Inaudible	37	Inaudible	39
72*	Inaudible	37	Inaudible	42
17	Inaudible	38	Inaudible	36
21	Inaudible	38	Inaudible	38
22	Inaudible	38	Inaudible	38
18	Inaudible	39	Inaudible	38
20	Inaudible	40	Inaudible	39
61*	Inaudible	40	Inaudible	39
14	Inaudible	39	Inaudible	39
19	Inaudible	40	Inaudible	39
16*	Inaudible	41	Inaudible	39
23	Inaudible	35	Inaudible	35
35*	Inaudible	35	Inaudible	35
42*	Inaudible	35	Inaudible	35
37	Inaudible	35	Inaudible	35

* Measurement location

27 February 2017

Ref: 03012/7022

Jason Martin
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: FEBRUARY 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Tuesday 21st February 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

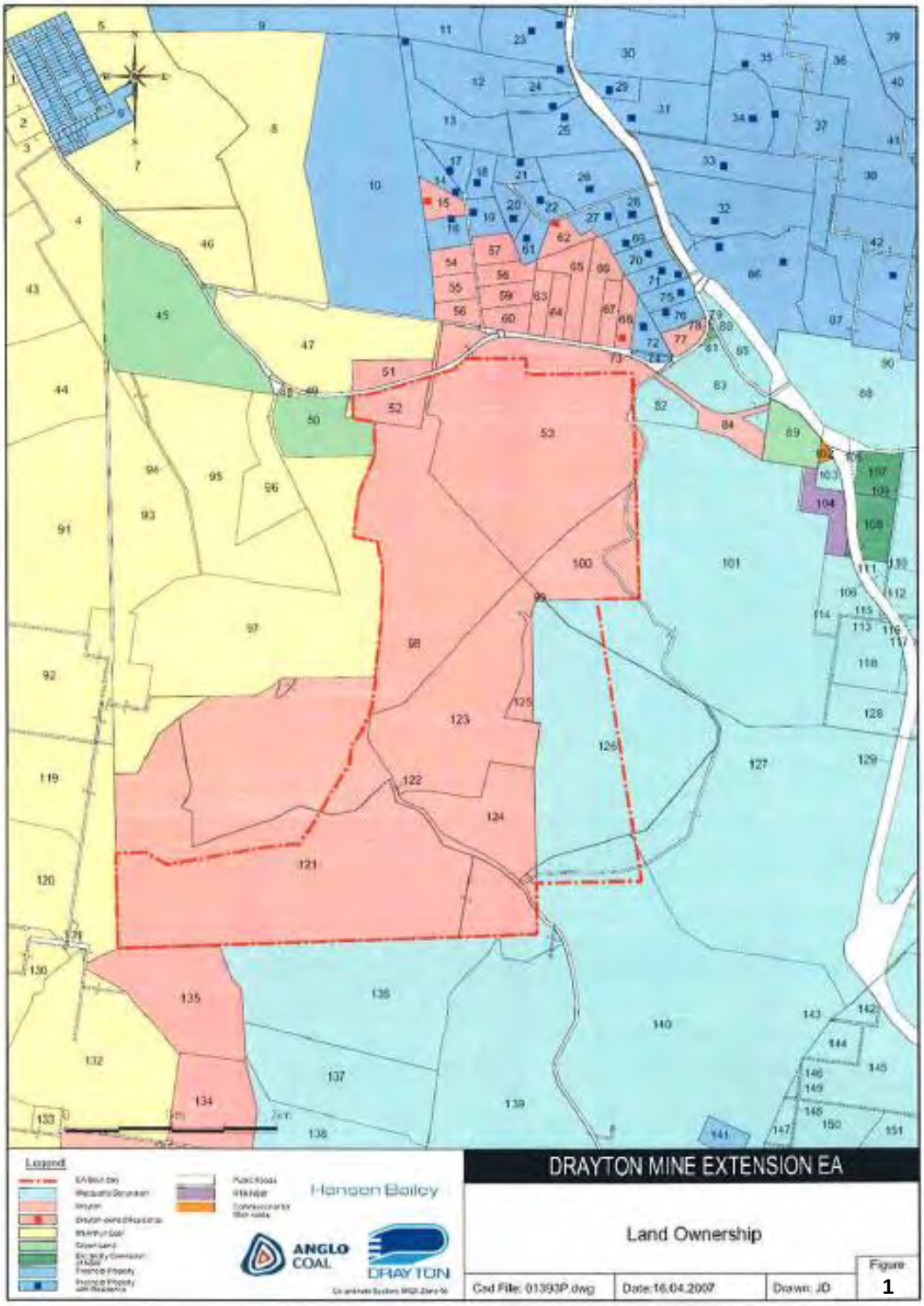
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not reasonable to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Two sets of measurements were made over the "circuit", one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were inaudible at all monitoring locations throughout the evening and night time periods.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
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DRAYTON
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Date:16.04.2007
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Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey.

Table 2
DCM Noise Monitoring Results – 21 February 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	7:21 pm	46	4.3/137	Birds (45), wind (39), traffic (29), **DCM inaudible**
Kerr (37)	7:41 pm	46	4.5/144	Traffic (45), wind (35), birds & insects (33), **DCM inaudible**
Skinner (40)	7:20 pm	40	4.3/137	Wind (39), traffic (33), birds (26), **DCM inaudible**
Robertson (37)	7:43 pm	55	4.6/143	Traffic (55), wind (40), birds (32), **DCM inaudible**
Sharman (35)	8:23 pm	54	4.8/138	Traffic (54), birds & insects (42), wind (35), **DCM inaudible**
Horder (36)	8:03 pm	43	4.7/141	Traffic (42), birds & frogs (33), wind (30), **DCM inaudible**
Wilson (35)	8:03 pm	41	4.7/141	Wind (38), traffic (37), insects (29), **DCM inaudible**
Smith (35)	8:25 pm	38	4.8/138	Traffic (35), wind (35), power station (25), **DCM inaudible**

Table 3
DCM Noise Monitoring Results – 21 February 2017 (Night)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (39)	10:02 pm	41	3.4/143	Insects (40), traffic (33), **DCM inaudible**
Kerr (37)	10:20 pm	45	3.4/146	Traffic (45), insects (30), **DCM inaudible**
Skinner (39)	10:00 pm	36	3.4/143	Traffic (33), insects (30), wind (29), **DCM inaudible**
Robertson (42)	10:25 pm	49	3.6/147	Traffic (49), insects (28), power station (25), **DCM inaudible**
Sharman (41)	11:04 pm	45	3.7/145	Traffic (45), insects (34), **DCM inaudible**
Horder (42)	10:45 pm	35	3.5/145	Traffic (34), insects (27), **DCM inaudible**
Wilson (36)	10:41 pm	36	3.4/144	Traffic (36), insects (23), **DCM inaudible**
Smith (36)	11:03 pm	31	3.7/145	Traffic (30), insects (23), **DCM inaudible**

Table 4 DCM Noise Monitoring Results – 21 February 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (47)	10:02 pm	44	3.4/143	Insects	n/a
Kerr (47)	10:20 pm	51	3.4/146	Highway	n/a
Skinner (47)	10:00 pm	36	3.4/143	Insects	n/a
Robertson (47)	10:25 pm	56	3.6/147	Traffic	n/a
Sharman (47)	11:04 pm	57	3.7/145	Highway	n/a
Horder (47)	10:45 pm	41	3.5/145	Traffic	n/a
Wilson (47)	10:41 pm	41	3.4/144	Highway	n/a
Smith (47)	11:03 pm	35	3.7/145	Highway	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emissions were inaudible at all receiver locations.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

As DCM was inaudible, there are applicable tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

As DCM operations were inaudible at all monitoring locations it can be extrapolated that DCM was inaudible at all receiver locations listed in the DCM Project Approval.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington
Acoustical Consultant

Review:

Ross Hodge
Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)				
Location	Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal
34	Inaudible	35	Inaudible	39
29	Inaudible	35	Inaudible	36
31	Inaudible	35	Inaudible	37
33	Inaudible	35	Inaudible	38
86	Inaudible	35	Inaudible	38
32	Inaudible	35	Inaudible	40
71	Inaudible	35	Inaudible	41
75*	Inaudible	35	Inaudible	41
70	Inaudible	36	Inaudible	41
76*	Inaudible	36	Inaudible	42
28	Inaudible	37	Inaudible	40
69	Inaudible	37	Inaudible	41
13	Inaudible	36	Inaudible	35
12	Inaudible	36	Inaudible	36
25*	Inaudible	37	Inaudible	37
26	Inaudible	37	Inaudible	38
27	Inaudible	37	Inaudible	39
72*	Inaudible	37	Inaudible	42
17	Inaudible	38	Inaudible	36
21	Inaudible	38	Inaudible	38
22	Inaudible	38	Inaudible	38
18	Inaudible	39	Inaudible	38
20	Inaudible	40	Inaudible	39
61*	Inaudible	40	Inaudible	39
14	Inaudible	39	Inaudible	39
19	Inaudible	40	Inaudible	39
16*	Inaudible	41	Inaudible	39
23	Inaudible	35	Inaudible	35
35*	Inaudible	35	Inaudible	35
42*	Inaudible	35	Inaudible	35
37	Inaudible	35	Inaudible	35

* Measurement location

30 March 2017

Ref: 03012/7077

Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: MARCH 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Wednesday 29th March, 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

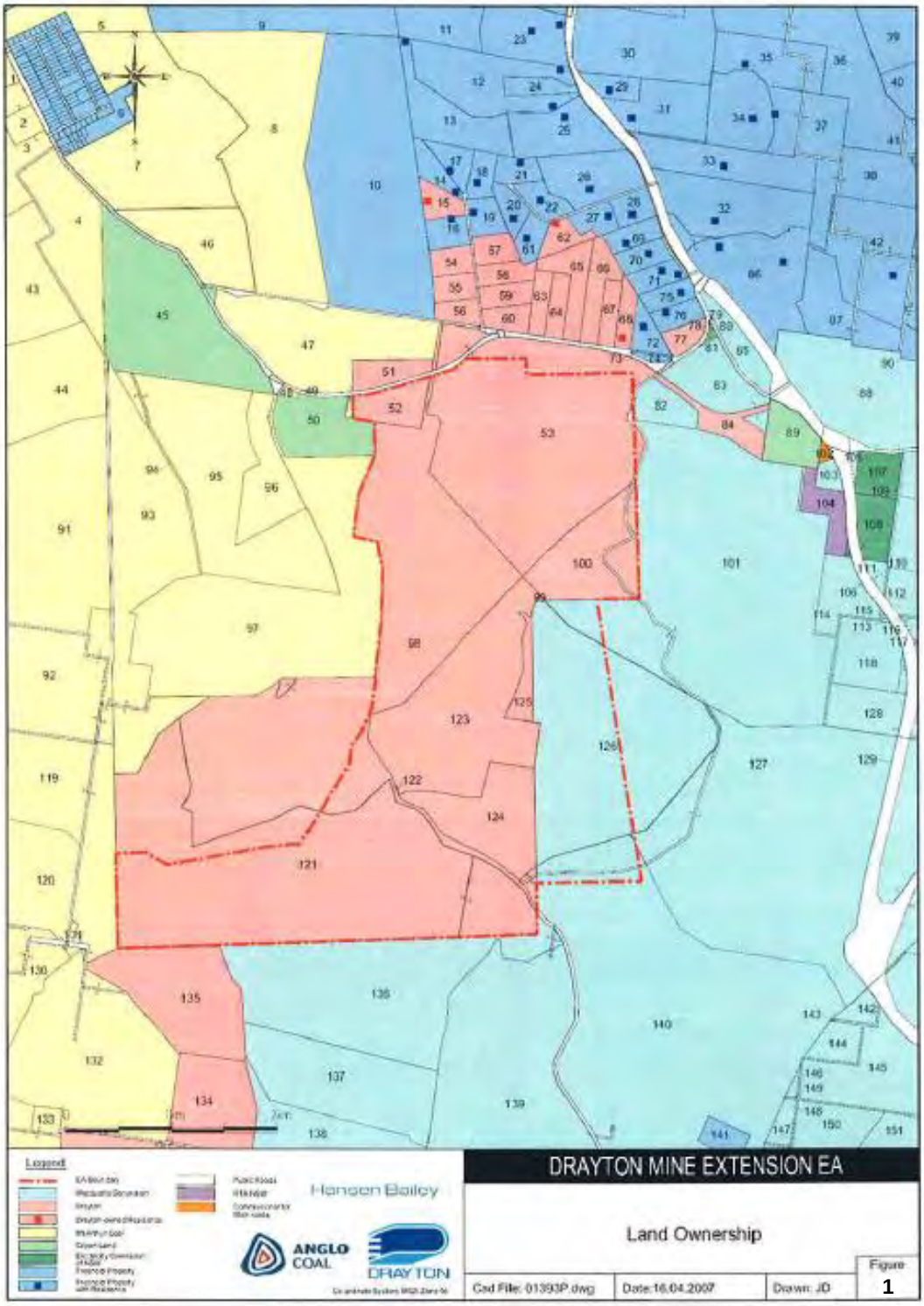
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not reasonable to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Three sets of measurements were made over the "circuit", one during the day time period (before 6 pm), one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were inaudible at all monitoring locations throughout the survey.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date:16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey.

Table 1
DCM Noise Monitoring Results – 29 March 2017 (Day)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	3:02 am	37	2.0/274	Birds & insects (35), traffic (33), **DCM (<20)**
Kerr (36)	4:31 am	47	2.5/313	Traffic (47), birds & insects (31), **DCM (<20)**
Skinner (39)	4:10 am	43	2.5/294	Water pump (42), traffic (33), birds (30), **DCM (<20)**
Robertson (36)	3:24 am	60	2.6/260	Traffic (60), birds (26), **DCM (<20)**
Sharman (35)	3:44 am	61	1.9/278	Traffic (61), birds (29), **DCM (<20)**
Horder (35)	5:37 am	45	1.2/303	Traffic (45), birds (32), **DCM (<20)**
Wilson (35)	4:51 pm	42	2.3/277	Traffic (42), birds & insects (30), **DCM (<20)**
Smith (35)	5:13 pm	34	1.7/314	Traffic (31), birds & insects (31), **DCM (<20)**

Table 2
DCM Noise Monitoring Results – 29 March 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	7:14 pm	50	1.4/301	Frogs & insects (50), traffic (35), other mine (26), **DCM (<20)**
Kerr (37)	9:25 pm	50	0.2/307	Traffic (50), insects (36), **DCM (<20)**
Skinner (40)	9:02 pm	40	0.7/285	Traffic (38), frogs & insects (34), other mine (24), **DCM (<20)**
Robertson (37)	7:36 pm	55	1.7/270	Traffic (55), insects (52), **DCM (<20)**
Sharman (35)	6:50 pm	59	1.5/298	Traffic (59), insects (33), **DCM (<20)**
Horder (36)	7:55 pm	44	1.3/340	Traffic (43), frogs & insects (38), **DCM (<20)**
Wilson (35)	8:17 pm	37	1.4/295	Traffic (36), frogs & insects (29), **DCM (<20)**
Smith (35)	8:40 pm	45	1.0/313	Insects (45), traffic (30), **DCM (<20)**

Table 3 DCM Noise Monitoring Results – 29/30 March 2017 (Night)				
Location (Criterion)	**Time**	**dB(A), $L_{eq(15min)}$**	**Wind speed/ direction**	**Identified Noise Sources**
Doherty (39)	10:00 pm	38	0.5/331	Traffic (36), frogs & insects (33), **DCM (<20)**
Kerr (37)	11:05 pm	49	0.9/297	Traffic (49), frogs & insects (32), **DCM (<20)**
Skinner (39)	10:43 pm	40	0.6/283	Traffic (39), frogs & insects (34), **DCM (<20)**
Robertson (42)	12:10 am	42	1.3/308	Traffic (41), insects (36), **DCM (<20)**
Sharman (41)	12:28 pm	57	1.7/302	Traffic (57), insects (34), **DCM (<20)**
Horder (42)	10:22 pm	46	0.7/319	Traffic (45), frogs & insects (38), **DCM (<20)**
Wilson (36)	11:24 pm	34	1.1/299	Traffic (33), frogs & insects (27), **DCM (<20)**
Smith (36)	11:50 pm	38	1.3/310	Insects (37), traffic (30), **DCM (<20)**

Table 4 DCM Noise Monitoring Results – 29/30 March 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\,(1\,min)}$)**
Doherty (47)	10:00 pm	43	0.5/331	Highway	n/a
Kerr (47)	11:05 pm	58	0.9/297	Highway	n/a
Skinner (47)	10:43 pm	46	0.6/283	Frogs	n/a
Robertson (47)	12:10 am	57	1.3/308	Traffic	n/a
Sharman (47)	12:28 pm	67	1.7/302	Highway	n/a
Horder (47)	10:22 pm	51	0.7/319	Traffic	n/a
Wilson (47)	11:24 pm	41	1.1/299	Highway	n/a
Smith (47)	11:50 pm	43	1.3/310	Insects	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emissions were inaudible at all receiver locations.

Data from those times where DCM operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

The operational noise levels at other receivers listed in the DCM Project Approval were determined using the ENM noise model in point calculation mode. The noise model was set up with a series of point noise sources representing the DCM operations and then calibrated to be consistent with the measured noise levels from the attended survey under similar atmospheric conditions to those at the time of the monitoring. Point calculations were then performed for each of the listed residential locations with results shown in **Appendix B**.

As the $L_{1(1minute)}$ levels were well below the sleep disturbance criterion at the attended monitoring locations, no modelling of $L_{1(1minute)}$ levels was conducted for other receiver locations, as these are all at greater distance from the DCM.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington
Acoustical Consultant

Review:

Ross Hodge
Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)						
Location	Day		Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal	Noise Level	Noise Goal
34	<30	35	<30	35	<30	39
29	<30	35	<30	35	<30	36
31	<30	35	<30	35	<30	37
33	<30	35	<30	35	<30	38
86	<30	35	<30	35	<30	38
32	<30	35	<30	35	<30	40
71	<30	35	<30	35	<30	41
75*	<30	35	<30	35	<30	41
70	<30	35	<30	36	<30	41
76*	<30	35	<30	36	<30	42
28	<30	35	<30	37	<30	40
69	<30	35	<30	37	<30	41
13	<30	36	<30	36	<30	35
12	<30	36	<30	36	<30	36
25*	<30	36	<30	37	<30	37
26	<30	36	<30	37	<30	38
27	<30	36	<30	37	<30	39
72*	<30	36	<30	37	<30	42
17	<30	37	<30	38	<30	36
21	<30	38	<30	38	<30	38
22	<30	38	<30	38	<30	38
18	<30	38	<30	39	<30	38
20	<30	39	<30	40	<30	39
61*	<30	39	<30	40	<30	39
14	<30	40	<30	39	<30	39
19	<30	40	<30	40	<30	39
16*	<30	41	<30	41	<30	39
23	<30	35	<30	35	<30	35
35*	<30	35	<30	35	<30	35
42*	<30	35	<30	35	<30	35
37	<30	35	<30	35	<30	35

* Measurement location

8 May 2017

Ref: 03012/7135

Jason Martin
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: APRIL 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Friday 28th April 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

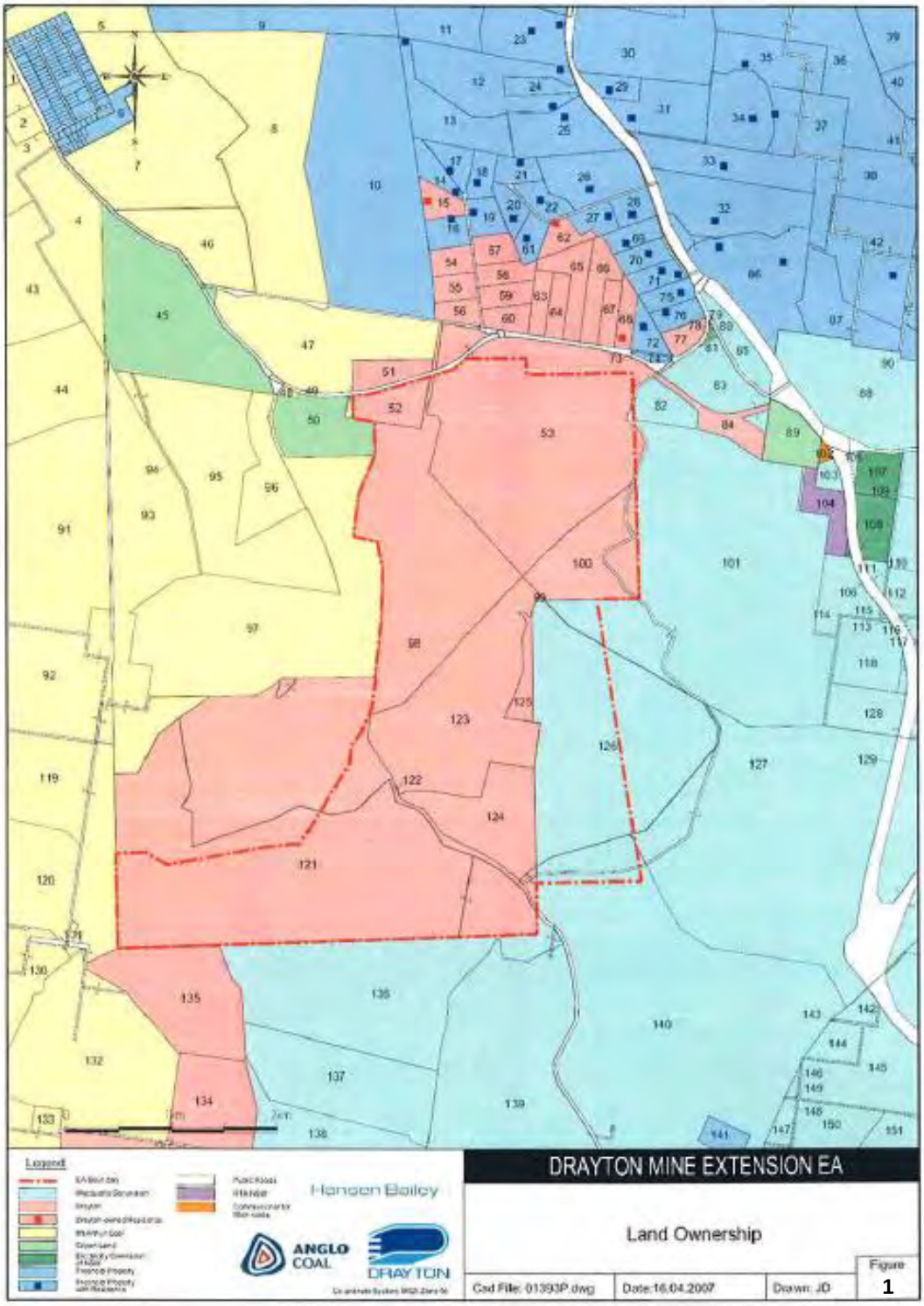
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not reasonable to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Two sets of measurements were made over the "circuit", one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were inaudible at all monitoring locations throughout the evening and night time periods.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date:16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey.

Table 2
DCM Noise Monitoring Results – 28 April 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	7:23 pm	35	1.6/270	Traffic (34), Insects (27), **DCM inaudible**
Kerr (37)	7:39 pm	52	0.5/273	Traffic (52), **DCM inaudible**
Skinner (40)	7:22 pm	47	1.6/270	Frogs (45), traffic (42), **DCM inaudible**
Robertson (37)	7:45 pm	42	0.5/273	Traffic (42), **DCM inaudible**
Sharman (35)	8:22 pm	52	2.1/194	Traffic (52), **DCM inaudible**
Horder (36)	8:05 pm	43	1.0/267	Traffic (43), frogs (30), **DCM inaudible**
Wilson (35)	8:04 pm	37	1.0/267	Industry (36), insects (28), **DCM inaudible**
Smith (35)	8:28 pm	41	2.1/194	Traffic (41), frogs (30), **DCM inaudible**

Table 3
DCM Noise Monitoring Results – 28 April 2017 (Night)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (39)	10:00 pm	38	2.1/263	Traffic (34), mine (33), frogs (29), **DCM inaudible**
Kerr (37)	10:22 pm	50	2.6/263	Traffic (50), **DCM inaudible**
Skinner (39)	10:00 pm	43	2.1/263	Frogs (41), traffic (37), **DCM inaudible**
Robertson (42)	10:24 pm	49	2.6/263	Traffic (49), **DCM inaudible**
Sharman (41)	11:06 pm	52	2.2/269	Traffic (52), insects (38), **DCM inaudible**
Horder (42)	10:46 pm	35	2.9/268	Traffic (33), frogs (30), **DCM inaudible**
Wilson (36)	10:43 pm	45	2.9/268	Traffic (42), industry (38), insects (34), **DCM inaudible**
Smith (36)	11:05 pm	43	2.2/269	Traffic (41), frogs (37), **DCM inaudible**

Table 4 DCM Noise Monitoring Results – 28 April 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (47)	10:00 pm	42	2.1/263	Highway	n/a
Kerr (47)	10:22 pm	56	2.6/263	Highway	n/a
Skinner (47)	10:00 pm	44	2.1/263	Frogs	n/a
Robertson (47)	10:24 pm	54	2.6/263	Traffic	n/a
Sharman (47)	11:06 pm	56	2.2/269	Highway	n/a
Horder (47)	10:46 pm	38	2.9/268	Traffic	n/a
Wilson (47)	10:43 pm	45	2.9/268	Highway	n/a
Smith (47)	11:05 pm	43	2.2/269	Highway	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emissions were inaudible at all receiver locations.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

As DCM was inaudible, there are no applicable tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

As DCM operations were inaudible at all monitoring locations it can be extrapolated that DCM was inaudible at all receiver locations listed in the DCM Project Approval.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington

Acoustical Consultant

Review:

Ross Hodge

Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)				
Location	Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal
34	Inaudible	35	Inaudible	39
29	Inaudible	35	Inaudible	36
31	Inaudible	35	Inaudible	37
33	Inaudible	35	Inaudible	38
86	Inaudible	35	Inaudible	38
32	Inaudible	35	Inaudible	40
71	Inaudible	35	Inaudible	41
75*	Inaudible	35	Inaudible	41
70	Inaudible	36	Inaudible	41
76*	Inaudible	36	Inaudible	42
28	Inaudible	37	Inaudible	40
69	Inaudible	37	Inaudible	41
13	Inaudible	36	Inaudible	35
12	Inaudible	36	Inaudible	36
25*	Inaudible	37	Inaudible	37
26	Inaudible	37	Inaudible	38
27	Inaudible	37	Inaudible	39
72*	Inaudible	37	Inaudible	42
17	Inaudible	38	Inaudible	36
21	Inaudible	38	Inaudible	38
22	Inaudible	38	Inaudible	38
18	Inaudible	39	Inaudible	38
20	Inaudible	40	Inaudible	39
61*	Inaudible	40	Inaudible	39
14	Inaudible	39	Inaudible	39
19	Inaudible	40	Inaudible	39
16*	Inaudible	41	Inaudible	39
23	Inaudible	35	Inaudible	35
35*	Inaudible	35	Inaudible	35
42*	Inaudible	35	Inaudible	35
37	Inaudible	35	Inaudible	35

* Measurement location

23 June 2017

Ref: 03012/7213

Matt Lord
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: MAY 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Friday 26th May 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not feasible to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
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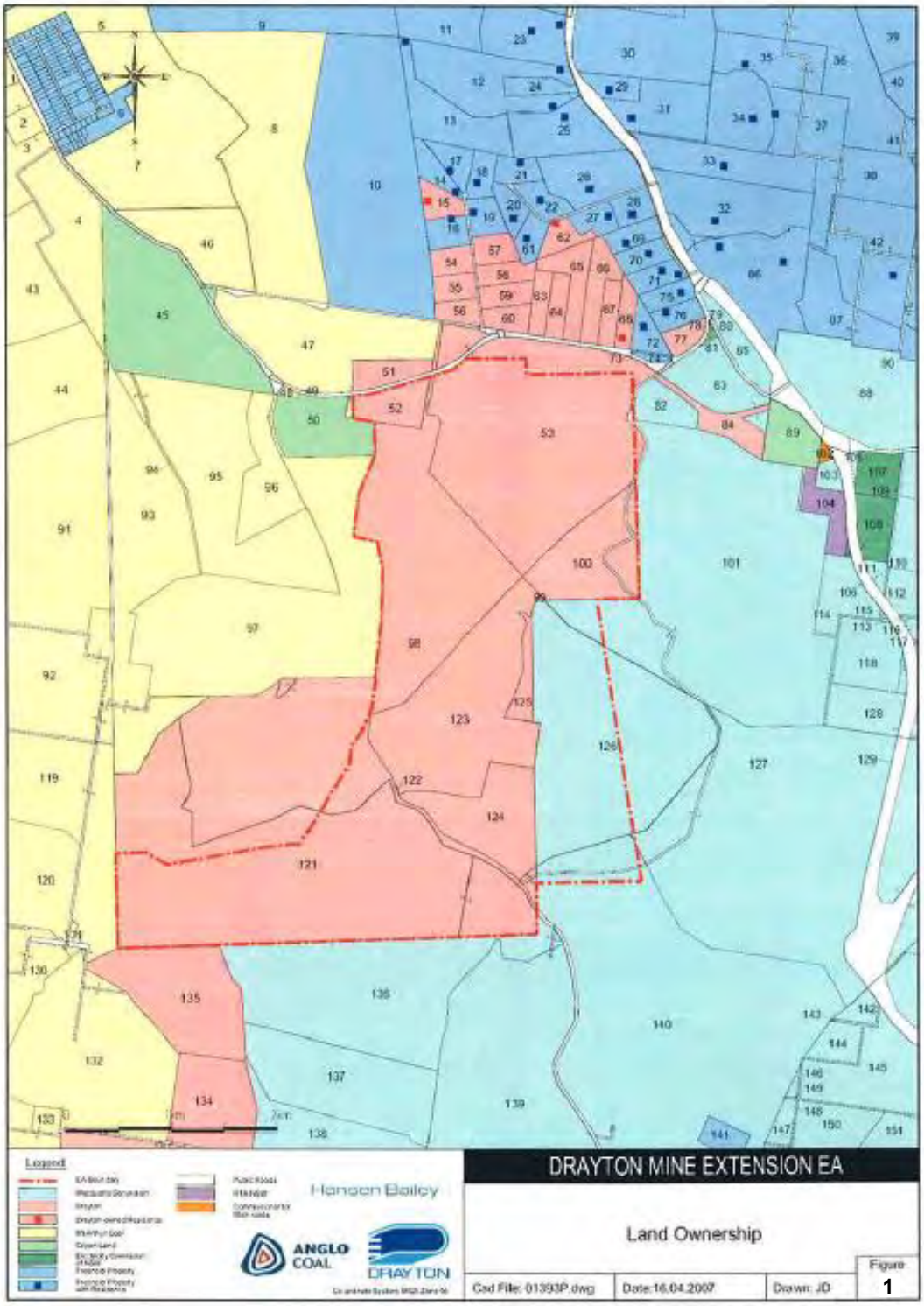
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Two sets of measurements were made over the "circuit", one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were inaudible at all monitoring locations throughout the evening and night time periods.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date:16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey.

Table 2
DCM Noise Monitoring Results – 26 May 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	6:36 pm	37	0.1 / 305	Traffic (36), Insects (30), **DCM inaudible**
Kerr (37)	9:04 pm	48	1.3 / 297	Traffic (48), **DCM inaudible**
Skinner (40)	8:40 pm	40	1.5 / 302	Traffic (39), Frogs (34), **DCM inaudible**
Robertson (37)	7:06 pm	48	0.8 / 330	Traffic (48), Train (35), **DCM inaudible**
Sharman (35)	7:52 pm	53	0.9 / 301	Traffic (53), **DCM inaudible**
Horder (36)	7:29 pm	39	1.0 / 323	Traffic (39), frogs (28), **DCM inaudible**
Wilson (35)	8:17 pm	39	1.3 / 300	Traffic (38), insects (29), **DCM inaudible**
Smith (35)	9:28 pm	42	1.6 / 295	Traffic (38), Industry to SE (36), train (34), **DCM inaudible**

Table 3
DCM Noise Monitoring Results – 26-27 May 2017 (Night)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (39)	12:46 am	36	2.7 / 298	Traffic (35), insects (30), **DCM inaudible**
Kerr (37)	10:59 pm	47	1.9 / 302	Traffic (47), **DCM inaudible**
Skinner (39)	11:21 pm	40	1.7 / 300	Traffic (39), Frogs (32), **DCM inaudible**
Robertson (42)	12:28 am	45	2.8 / 298	Traffic (45), **DCM inaudible**
Sharman (41)	11:49 pm	54	2.7 / 295	Traffic (54), **DCM inaudible**
Horder (42)	12:08 am	40	2.1 / 308	Traffic (39), frogs (30), **DCM inaudible**
Wilson (36)	10:28 pm	44	2.0 / 285	Traffic (43), industry (34), **DCM inaudible**
Smith (36)	10:05 pm	44	2.3 / 292	Traffic (41), Mine hum to SE (41), **DCM inaudible**

Table 4 DCM Noise Monitoring Results – 28 April 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (47)	12:46 am	41	2.7 / 298	Traffic	n/a
Kerr (47)	10:59 pm	56	1.9 / 302	Traffic	n/a
Skinner (47)	11:21 pm	42	1.7 / 300	Traffic	n/a
Robertson (47)	12:28 am	50	2.8 / 298	Traffic	n/a
Sharman (47)	11:49 pm	61	2.7 / 295	Traffic	n/a
Horder (47)	12:08 am	44	2.1 / 308	Traffic	n/a
Wilson (47)	10:28 pm	46	2.0 / 285	Traffic	n/a
Smith (47)	10:05 pm	44	2.3 / 292	Traffic	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emissions were inaudible at all receiver locations.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

As DCM was inaudible, there are no applicable tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

As DCM operations were inaudible at all monitoring locations it can be extrapolated that DCM was inaudible at all receiver locations listed in the DCM Project Approval.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington
Acoustical Consultant

Review:

Ross Hodge
Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)				
Location	Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal
34	Inaudible	35	Inaudible	39
29	Inaudible	35	Inaudible	36
31	Inaudible	35	Inaudible	37
33	Inaudible	35	Inaudible	38
86	Inaudible	35	Inaudible	38
32	Inaudible	35	Inaudible	40
71	Inaudible	35	Inaudible	41
75*	Inaudible	35	Inaudible	41
70	Inaudible	36	Inaudible	41
76*	Inaudible	36	Inaudible	42
28	Inaudible	37	Inaudible	40
69	Inaudible	37	Inaudible	41
13	Inaudible	36	Inaudible	35
12	Inaudible	36	Inaudible	36
25*	Inaudible	37	Inaudible	37
26	Inaudible	37	Inaudible	38
27	Inaudible	37	Inaudible	39
72*	Inaudible	37	Inaudible	42
17	Inaudible	38	Inaudible	36
21	Inaudible	38	Inaudible	38
22	Inaudible	38	Inaudible	38
18	Inaudible	39	Inaudible	38
20	Inaudible	40	Inaudible	39
61*	Inaudible	40	Inaudible	39
14	Inaudible	39	Inaudible	39
19	Inaudible	40	Inaudible	39
16*	Inaudible	41	Inaudible	39
23	Inaudible	35	Inaudible	35
35*	Inaudible	35	Inaudible	35
42*	Inaudible	35	Inaudible	35
37	Inaudible	35	Inaudible	35

* Measurement location

14 July 2017

Ref: 03012/7264

Matt Lord
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: JUNE 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Thursday 29th June 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

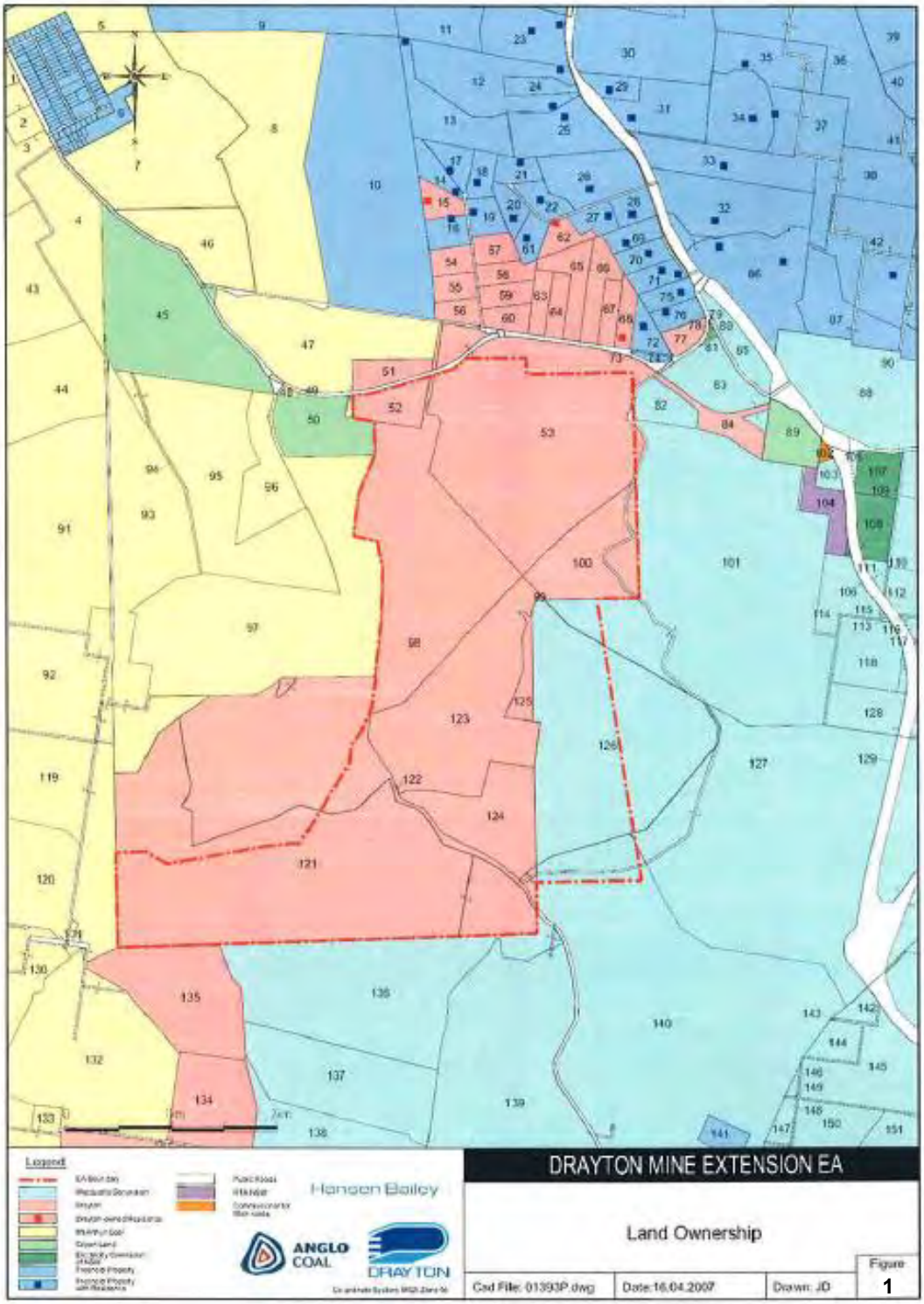
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not reasonable to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Three sets of measurements were made over the "circuit", one during the day time period (before 6 pm), one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were audible at many monitoring locations throughout the survey.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date: 16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey. Where DCM is inaudible a value of <20 has been assigned to enable numerical comparison with noise criteria.

Table 1
DCM Noise Monitoring Results – 29 June 2017 (Day)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	2:50 pm	42	4.0/303	Wind (40), birds (36), traffic (27), other mine (26), **DCM (<20)**
Kerr (36)	4:38 pm	46	3.2/298	Traffic (46), wind (31), other mine (26), **DCM (<20)**
Skinner (39)	4:16 pm	39	3.0/299	Birds (36), wind (35), traffic (28), other mine (24), **DCM (<20)**
Robertson (36)	3:13 pm	57	3.8/294	Traffic (57), wind (33), birds (28), **DCM (<20)**
Sharman (35)	3:53 pm	54	3.6/300	Traffic (54), birds (40), wind (33), **DCM (<20)**
Horder (35)	3:32 pm	50	3.5/296	Wind (46), traffic (45), birds (37), **DCM (<20)**
Wilson (35)	5:03 pm	41	2.8/310	Traffic (41), **DCM (<20)**
Smith (35)	5:29 pm	42	2.5/311	Traffic (42), **DCM (<20)**

Table 2
DCM Noise Monitoring Results – 29 June 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	6:28 pm	38	2.6/3.5	Other mine (35), traffic (30), **DCM (<20)**, frogs (29)
Kerr (37)	8:21 pm	43	2.5/3.5	Traffic (43), other mine (31), **DCM (<20)**
Skinner (40)	7:59 pm	38	3.2/292	Other mine (34), traffic (32), wind (32), frogs (28), **DCM (<20)**
Robertson (37)	6:51 pm	46	2.6/301	Traffic (46), wind (32), **DCM (<20)**
Sharman (35)	7:33 pm	48	3.3/300	Traffic (48), frogs (31), **DCM (<20)**, wind (27)
Horder (36)	7:13 pm	45	3.3/296	Wind (43), traffic (40), **DCM (<20)**
Wilson (35)	8:48 pm	42	3.3/307	Traffic (42), frogs (27), **DCM (<20)**
Smith (35)	9:18 pm	40	2.6/309	Traffic (39), wind (31), **DCM (<20)**

Table 3 DCM Noise Monitoring Results – 29/30 June 2017 (Night)				
Location (Criterion)	**Time**	**dB(A), $L_{eq(15min)}$**	**Wind speed/ direction**	**Identified Noise Sources**
Doherty (39)	10:00 pm	38	2.9/301	Other mine (36), traffic (29), frogs (28), **DCM (<20)**
Kerr (37)	11:49 pm	43	2.5/317	Traffic (43), **DCM (<20)**, other mine (25)
Skinner (39)	11:26 pm	37	2.4/318	Other mine (33), **DCM (<20)**, traffic (27), frogs (26)
Robertson (42)	10:21 pm	42	2.0/308	Traffic (41), **DCM (<20)**, wind (29)
Sharman (41)	11:03 pm	45	2.3/299	Traffic (45), frogs (27), **DCM (<20)**
Horder (42)	10:42 pm	41	2.5/308	Traffic (41), **DCM (<20)**
Wilson (36)	12:13 pm	39	2.9/306	Traffic (38), frogs (35), **DCM (<20)**
Smith (36)	12:38 pm	41	2.7/312	Traffic (39), wind (36), **DCM (<20)**

Table 4 DCM Noise Monitoring Results – 29/30 June 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (47)	10:00 pm	40	2.9/301	Other mine	n/a
Kerr (47)	11:49 pm	51	2.5/317	Highway	n/a
Skinner (47)	11:26 pm	37	2.4/318	Other mine	n/a
Robertson (47)	10:21 pm	50	2.0/308	Traffic	n/a
Sharman (47)	11:03 pm	54	2.3/299	Highway	n/a
Horder (47)	10:42 pm	48	2.5/308	Highway	n/a
Wilson (47)	12:13 pm	43	2.9/306	Highway	n/a
Smith (47)	12:38 pm	45	2.7/312	Highway	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

The operational noise levels at other receivers listed in the DCM Project Approval were determined using the ENM noise model in point calculation mode. The noise model was set up with a series of point noise sources representing the DCM operations and then calibrated to be consistent with the measured noise levels from the attended survey under similar atmospheric conditions to those at the time of the monitoring. Point calculations were then performed for each of the listed residential locations with results shown in **Appendix B**.

As the $L_{1(1minute)}$ levels were well below the sleep disturbance criterion at the attended monitoring locations, no modelling of $L_{1(1minute)}$ levels was conducted for other receiver locations, as these are all at greater distance from the DCM.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington, MAAS
Acoustical Consultant

Review:

Ross Hodge, MAAS
Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)						
Location	Day		Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal	Noise Level	Noise Goal
34	<20	35	<20	35	<20	39
29	<20	35	<20	35	<20	36
31	<20	35	<20	35	<20	37
33	<20	35	<20	35	<20	38
86	<20	35	<20	35	<20	38
32	<20	35	<20	35	<20	40
71	<20	35	<20	35	<20	41
75*	<20	35	<20	35	<20	41
70	<20	35	<20	36	<20	41
76*	<20	35	<20	36	<20	42
28	<20	35	<20	37	<20	40
69	<20	35	<20	37	<20	41
13	<20	36	<20	36	<20	35
12	<20	36	<20	36	<20	36
25*	<20	36	<20	37	<20	37
26	<20	36	<20	37	<20	38
27	<20	36	<20	37	<20	39
72*	<20	36	<20	37	<20	42
17	<20	37	<20	38	<20	36
21	<20	38	<20	38	<20	38
22	<20	38	<20	38	<20	38
18	<20	38	<20	39	<20	38
20	<20	39	<20	40	<20	39
61*	<20	39	<20	40	<20	39
14	<20	40	<20	39	<20	39
19	<20	40	<20	40	<20	39
16*	<20	41	<20	41	<20	39
23	<20	35	<20	35	<20	35
35*	<20	35	<20	35	<20	35
42*	<20	35	<20	35	<20	35
37	<20	35	<20	35	<20	35

* Measurement location

16 August 2017

Ref: 03012/7301

Matt Lord
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: JULY 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Monday 24th July, 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

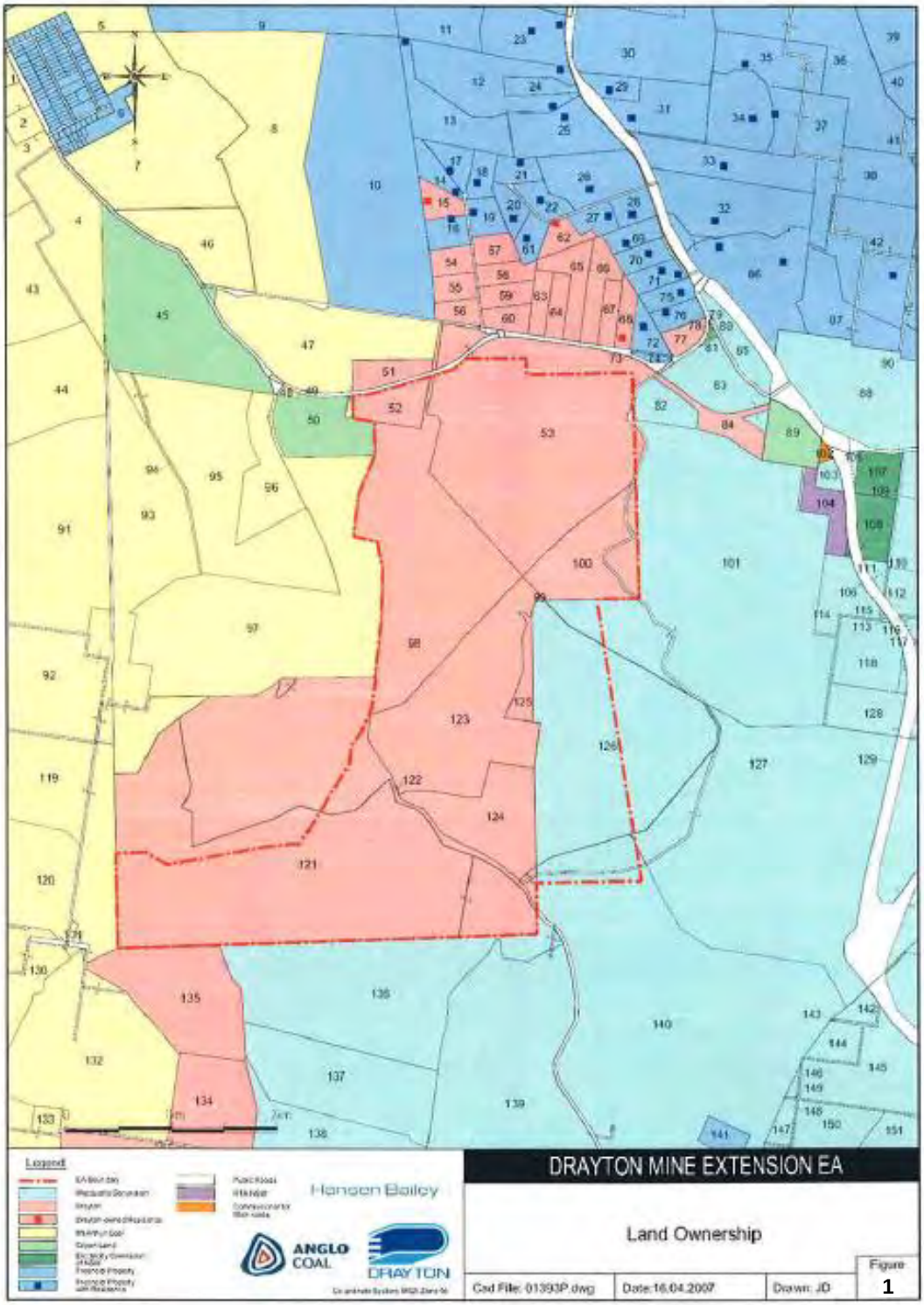
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not reasonable to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Two sets of measurements were made over the "circuit", one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were audible at certain monitoring locations throughout the evening and night time periods.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date:16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Attended noise monitoring was conducted with a Brüel & Kjær Type 2250 Precision Sound Analyser. This instrument has Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters" and has current NATA calibration. Field calibration is carried out at the start and end of each monitoring period.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-2** and night time $L_{1\ (1minute)}$ – approximated as measured L_{max} – in **Table 3**. Table 3 shows the overall $L_{1\ (1minute)}$ and the contributing source as well as the $L_{1\ (1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey. Where DCM is inaudible a value of <20 has been assigned to enable numerical comparison with noise criteria.

Table 1
DCM Noise Monitoring Results – 24 July 2017 (evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	6:14 pm	43	1.6 / 342	Traffic (42), other mine (34), frogs (26), **DCM (<20)**
Kerr (37)	8:54 pm	47	1.7 / 340	Traffic (47), other mine (25), **DCM (<20)**
Skinner (40)	8:31 pm	42	1.7 / 340	Traffic (42), other mine (30), **DCM (<20)**,
Robertson (37)	6:55 pm	44	1.6 / 342	Traffic (44), **DCM (<20)**
Sharman (35)	7:43 pm	50	2 / 329	Traffic (50), **DCM (<20)**
Horder (36)	7:17 pm	46	2 / 329	Traffic (45), frogs (39), **DCM (<20)**
Wilson (35)	8:06 pm	37	1.7 / 340	Traffic (33), frogs (33), **DCM (<20)**
Smith (35)	9:17 pm	34	1.8 / 345	Traffic (33), wind (25), **DCM (<20)**

Table 2
DCM Noise Monitoring Results – 24 July 2017 (night)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (39)	12:43 am	41	1.6 / 318	Traffic (40), Other mine (32), **DCM (<20)**
Kerr (37)	10:57 pm	45	1.5 / 327	Traffic (45), other mine (24), **DCM (<20)**
Skinner (39)	11:19 pm	43	2.2 / 329	Traffic (43), other mine (30), frogs (27), **DCM (<20)**
Robertson (42)	12:27 am	45	1.6 / 318	Traffic (45), **DCM (<20)**
Sharman (41)	11:46 pm	49	2.2 / 329	Traffic (49), **DCM (<20)**
Horder (42)	12:06 am	45	1.6 / 318	Traffic (42), frogs (40), **DCM (<20)**
Wilson (36)	10:25 pm	37	1.5 / 327	Traffic (37), **DCM (<20)**
Smith (36)	10:01 pm	35	1.5 / 327	Traffic (34), wind (27), **DCM <20)**

Table 3 DCM Noise Monitoring Results – 24 July 2017 (night)					
Location (Criterion)	**Time**	**dB(A), $L_{1\ (1min)}$**	**Wind speed/ direction**	**$L_{1\ (1\ min)}$ source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (47)	12:43 am	48	1.6 / 318	Highway traffic	N/A
Kerr (47)	10:57 pm	57	1.5 / 327	Highway traffic	N/A
Skinner (47)	11:19 pm	44	2.2 / 329	Highway traffic	N/A
Robertson (47)	12:27 am	56	1.6 / 318	Traffic	N/A
Sharman (47)	11:46 pm	58	2.2 / 329	Traffic	N/A
Horder (47)	12:06 am	50	1.6 / 318	Highway traffic	N/A
Wilson (47)	10:25 pm	44	1.5 / 327	Highway traffic	N/A
Smith (47)	10:01 pm	43	1.5 / 327	Highway traffic	N/A

The results in Tables 1 and 2 shows that the noise criterion was not exceeded at any location and DCM was therefore in compliance throughout the whole monitoring period.

Data from those times where DCM operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

The results in Table 3 show that the noise sleep disturbance criterion ($L_{1\ (1minute)}$) was not exceeded at any monitoring location during the night time period.

The operational noise levels at other receivers listed in the DCM Project Approval were determined using the ENM noise model in point calculation mode. Results are shown in **Appendix B**.

As the $L_{1\ (1minute)}$ levels were well below the sleep disturbance criterion at the attended monitoring locations, no modelling of $L_{1\ (1minute)}$ levels was conducted for other receiver locations, as these are all at greater distance from the DCM.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington, MAAS
Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)				
Location	Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal
34	<20	35	<20	39
29	<20	35	<20	36
31	<20	35	<20	37
33	<20	35	<20	38
86	<20	35	<20	38
32	<20	35	<20	40
71	<20	35	<20	41
75*	<20	35	<20	41
70	<20	36	<20	41
76*	<20	36	<20	42
28	<20	37	<20	40
69	<20	37	<20	41
13	<20	36	<20	35
12	<20	36	<20	36
25*	<20	37	<20	37
26	<20	37	<20	38
27	<20	37	<20	39
72*	<20	37	<20	42
17	<20	38	<20	36
21	<20	38	<20	38
22	<20	38	<20	38
18	<20	39	<20	38
20	<20	40	<20	39
61*	<20	40	<20	39
14	<20	39	<20	39
19	<20	40	<20	39
16*	<20	41	<20	39
23	<20	35	<20	35
35*	<20	35	<20	35
42*	<20	35	<20	35
37	<20	35	<20	35

* Measurement location

28 August 2017

Ref: 03012/7318

Matt Lord
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: AUGUST 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Friday 9th August 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

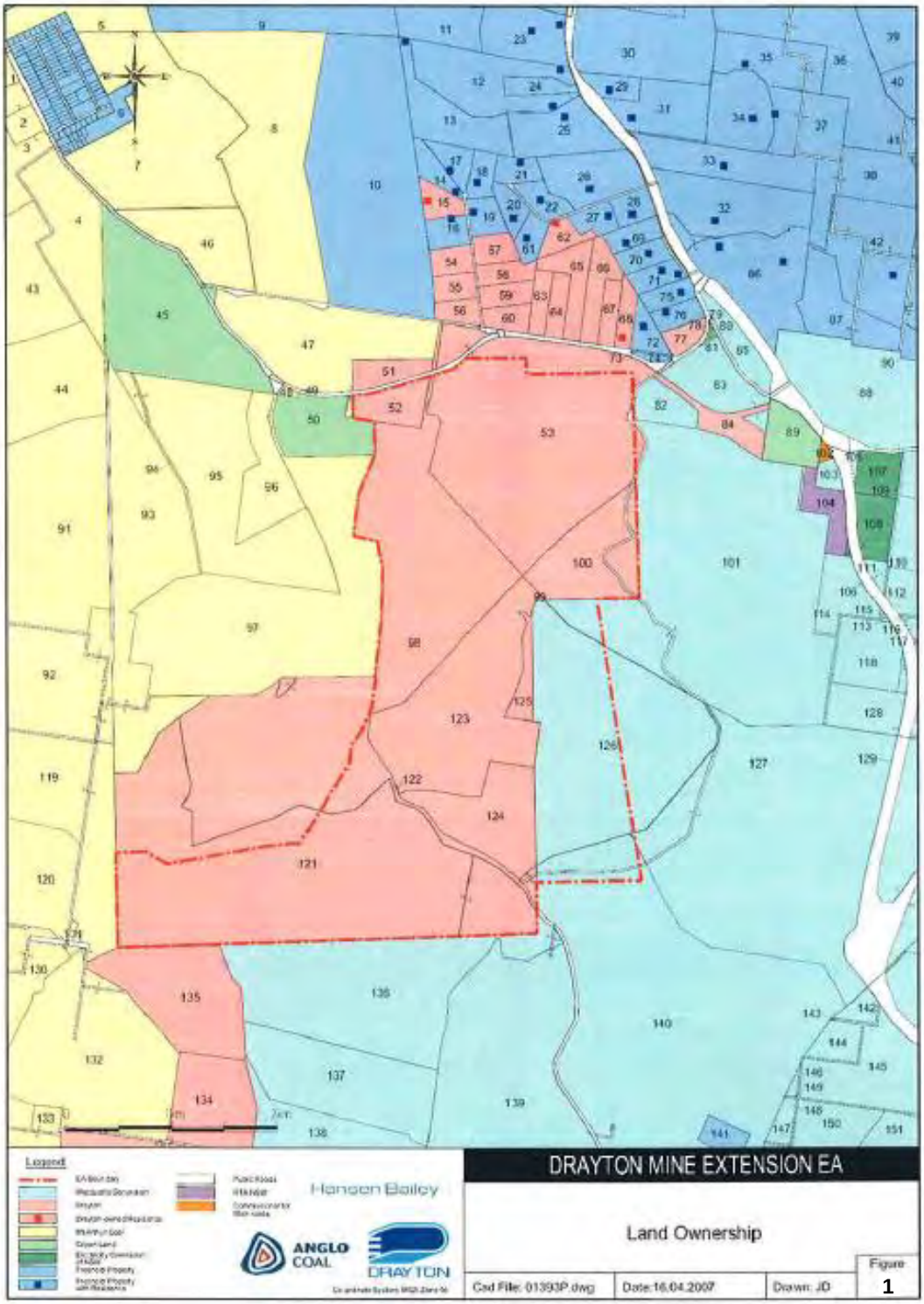
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not feasible to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Two sets of measurements were made over the "circuit", one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were inaudible at all monitoring locations throughout the evening and night time periods.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date: 16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey. Where DCM is inaudible a value of <20 has been assigned to enable numerical comparison with noise criteria.

Table 2
DCM Noise Monitoring Results – 9 August 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	6:51 pm	39	1.3 / 307	Traffic (35), Mine (35), Insects (31), **DCM (<20)**
Kerr (37)	8:51 pm	59	1.9 / 304	Traffic (59), **DCM (<20)**
Skinner (40)	8:33 pm	41	2.4 / 312	Traffic (41), Frogs (28), Mine (<30), **DCM (<20)**
Robertson (37)	7:19 pm	46	1.3 / 307	Traffic (45), Mine (<30), **DCM (<20)**
Sharman (35)	8:06 pm	54	2.4 / 312	Traffic (54), **DCM (<20)**
Horder (36)	7:46 pm	42	1.3 / 307	Traffic (41), frogs (33), **DCM (<20)**
Wilson (35)	9:21 pm	43	2.4 / 312	Traffic (43), **DCM (<20)**
Smith (35)	9:44 pm	37	1.9 / 304	Traffic (37), Mine (<25), **DCM (<20)**

Table 3
DCM Noise Monitoring Results – 9 August 2017 (Night)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (39)	12:43 am	42	1.8 / 308	Insects (38), Traffic (36), Mine (35), **DCM (<20)**
Kerr (37)	10:55 pm	59	1.7 / 299	Traffic (59), **DCM (<20)**
Skinner (39)	11:18 pm	42	1.7 / 304	Traffic (41), Mine (31), **DCM (<20)**
Robertson (42)	12:25 am	44	1.8 / 308	Traffic (44), **DCM (<20)**
Sharman (41)	11:45 pm	46	1.7 / 304	Traffic (46), Mine (32), **DCM (<20)**
Horder (42)	12:05 am	44	1.8 / 308	Traffic (44), Mine (<30), **DCM (<20)**
Wilson (36)	10:24 pm	43	1.7 / 299	Traffic (43), industry (<30), **DCM (<20)**
Smith (36)	10:00 pm	36	1.7 / 299	Traffic (35), Mine (<30), **DCM (<20)**

Table 4 DCM Noise Monitoring Results – 9 August 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (47)	12:43 am	48	1.8 / 308	Traffic	n/a
Kerr (47)	10:55 pm	63	1.7 / 299	Traffic	n/a
Skinner (47)	11:18 pm	47	1.7 / 304	Traffic	n/a
Robertson (47)	12:25 am	51	1.8 / 308	Traffic	n/a
Sharman (47)	11:45 pm	60	1.7 / 304	Traffic	n/a
Horder (47)	12:05 am	48	1.8 / 308	Traffic	n/a
Wilson (47)	10:24 pm	45	1.7 / 299	Traffic	n/a
Smith (47)	10:00 pm	40	1.7 / 299	Traffic	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emissions were inaudible at all receiver locations.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

As DCM was inaudible, there are no applicable tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

As DCM operations were inaudible at all monitoring locations it can be extrapolated that DCM was inaudible at all receiver locations listed in the DCM Project Approval.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington, MAAS
Acoustical Consultant

Review:

Ross Hodge, MAAS
Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)				
Location	Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal
34	<20	35	<20	39
29	<20	35	<20	36
31	<20	35	<20	37
33	<20	35	<20	38
86	<20	35	<20	38
32	<20	35	<20	40
71	<20	35	<20	41
75*	<20	35	<20	41
70	<20	36	<20	41
76*	<20	36	<20	42
28	<20	37	<20	40
69	<20	37	<20	41
13	<20	36	<20	35
12	<20	36	<20	36
25*	<20	37	<20	37
26	<20	37	<20	38
27	<20	37	<20	39
72*	<20	37	<20	42
17	<20	38	<20	36
21	<20	38	<20	38
22	<20	38	<20	38
18	<20	39	<20	38
20	<20	40	<20	39
61*	<20	40	<20	39
14	<20	39	<20	39
19	<20	40	<20	39
16*	<20	41	<20	39
23	<20	35	<20	35
35*	<20	35	<20	35
42*	<20	35	<20	35
37	<20	35	<20	35

* Measurement location

5 October 2017

Ref: 03012/7318

Matt Lord
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: SEPTEMBER 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Thursday 21st September 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

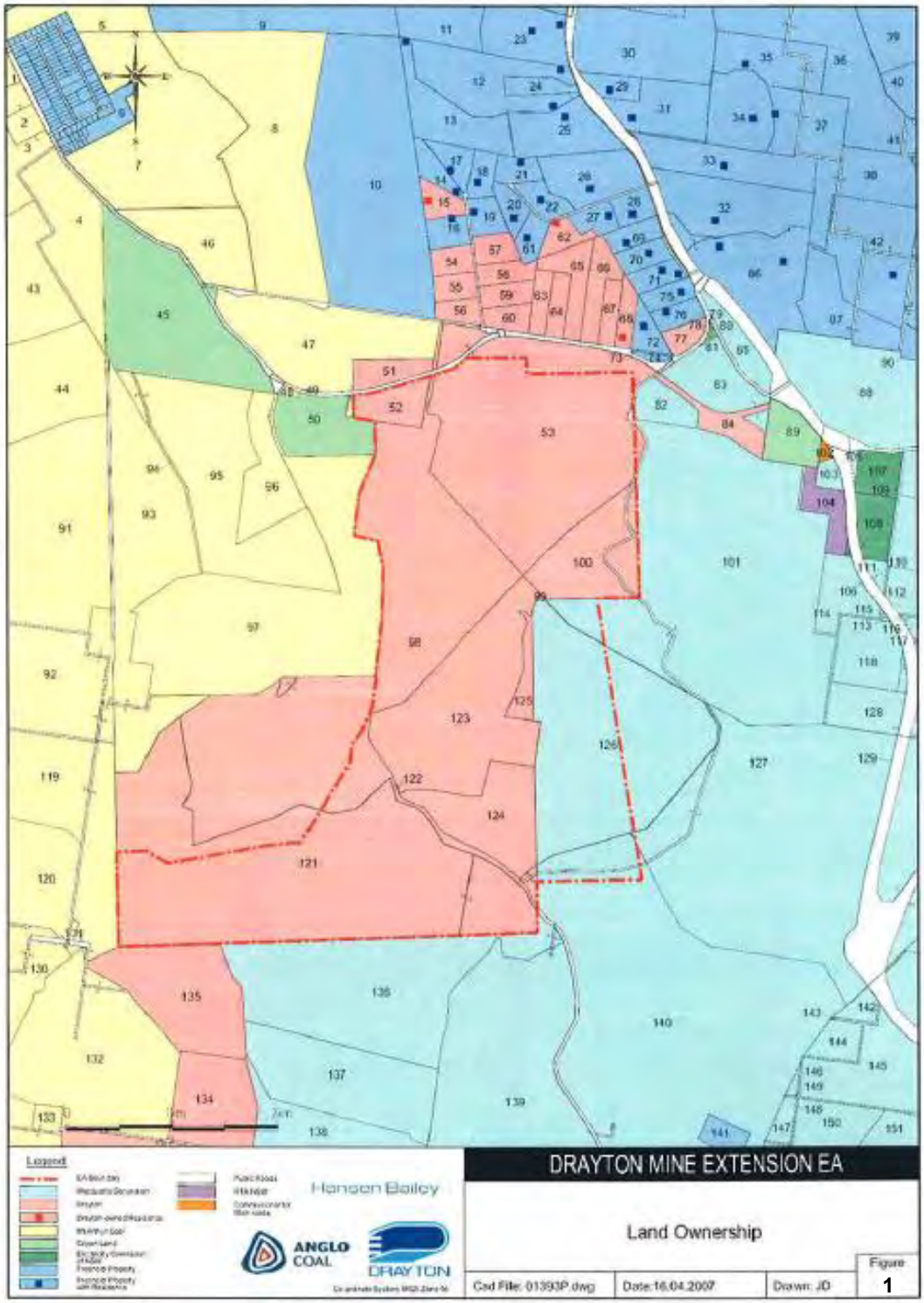
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not feasible to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Three sets of measurements were made over the "circuit", one each during the day (7 am – 6 pm), evening (from 6 pm – 10 pm) and night (after 10 pm) periods. DCM activities were inaudible at all monitoring locations throughout the evening and night time periods.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date: 16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey. Where DCM is inaudible a value of <20 has been assigned to enable numerical comparison with noise criteria.

Table 1
DCM Noise Monitoring Results – 21 September 2017 (Day)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	3:01 pm	40	2.5 / 295	Birds (40), wind (28), traffic (25), **DCM (<20)**
Kerr (36)	4:51 pm	49	1.8 / 310	Traffic (49), birds (37), **DCM (<20)**
Skinner (39)	4:31 pm	41	2.0 / 273	Birds (40), traffic (32), **DCM (<20)**
Robertson (36)	3:21 pm	50	2.6 / 290	Traffic (50), wind (36), birds (30), **DCM (<20)**
Sharman (35)	4:03 pm	57	2.3 / 280	Traffic (57), birds (36), **DCM (<20)**
Horder (35)	3:44 pm	45	2.4 / 254	Traffic (43), birds (39), **DCM (<20)**
Wilson (35)	5:16 pm	37	1.1 / 246	Traffic (38), birds (31), **DCM (<20)**
Smith (35)	5:37 pm	36	0.6 / 299	Traffic (34), birds (29), **DCM (<20)**

Table 2
DCM Noise Monitoring Results – 21 September 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	6:45 pm	36	1.6 / 309	Traffic (35), frogs (29), **DCM (<20)**
Kerr (37)	8:46 pm	61	1.2 / 313	Traffic (61), **DCM (<20)**
Skinner (40)	8:28 pm	42	1.2 / 314	Traffic (42), **DCM (<20)**
Robertson (37)	7:13 pm	51	1.4 / 308	Traffic (51), **DCM (<20)**
Sharman (35)	8:00 pm	53	1.3 / 297	Traffic (53), **DCM (<20)**
Horder (36)	7:41 pm	63	1.4 / 315	Dog (63), Traffic (44), **DCM (<20)**
Wilson (35)	9:17 pm	41	1.2 / 294	Traffic (41), **DCM (<20)**
Smith (35)	9:39 pm	35	1.1 / 272	Traffic (35), **DCM (<20)**

Table 3 DCM Noise Monitoring Results – 21-22 September 2017 (Night)				
Location (Criterion)	**Time**	**dB(A), $L_{eq(15min)}$**	**Wind speed/ direction**	**Identified Noise Sources**
Doherty (39)	12:47 am	36	2.2 / 284	Traffic (35), Mine (26), **DCM (<20)**
Kerr (37)	10:58 pm	56	2.0 / 295	Traffic (56), **DCM (<20)**
Skinner (39)	11:20 pm	42	2.1 / 310	Traffic (42), **DCM (<20)**
Robertson (42)	12:26 am	50	2.2 / 284	Traffic (50), train (43), **DCM (<20)**
Sharman (41)	11:47 pm	50	2.2 / 284	Traffic (50), **DCM (<20)**
Horder (42)	12:06 am	40	2.2 / 284	Traffic (40), **DCM (<20)**
Wilson (36)	10:27 pm	38	1.7 / 290	Traffic (37), industry (28), **DCM (<20)**
Smith (36)	10:02 pm	37	1.0 / 290	Industrial (37), **DCM (<20)**

Table 4 DCM Noise Monitoring Results – 21 September 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (47)	12:47 am	45	2.2 / 284	Traffic	n/a
Kerr (47)	10:58 pm	65	2.0 / 295	Traffic	n/a
Skinner (47)	11:20 pm	48	2.1 / 310	Traffic	n/a
Robertson (47)	12:26 am	58	2.2 / 284	Traffic	n/a
Sharman (47)	11:47 pm	61	2.2 / 284	Traffic	n/a
Horder (47)	12:06 am	46	2.2 / 284	Traffic	n/a
Wilson (47)	10:27 pm	41	1.7 / 290	Traffic	n/a
Smith (47)	10:02 pm	39	1.0 / 290	Industry	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emissions were inaudible at all receiver locations.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

As DCM was inaudible, there are no applicable tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy. As DCM operations were inaudible at all monitoring locations it can be extrapolated that DCM was inaudible at all receiver locations listed in the DCM Project Approval.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington, MAAS

Acoustical Consultant

Review:

Ross Hodge, MAAS

Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)				
Location	Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal
34	<20	35	<20	39
29	<20	35	<20	36
31	<20	35	<20	37
33	<20	35	<20	38
86	<20	35	<20	38
32	<20	35	<20	40
71	<20	35	<20	41
75*	<20	35	<20	41
70	<20	36	<20	41
76*	<20	36	<20	42
28	<20	37	<20	40
69	<20	37	<20	41
13	<20	36	<20	35
12	<20	36	<20	36
25*	<20	37	<20	37
26	<20	37	<20	38
27	<20	37	<20	39
72*	<20	37	<20	42
17	<20	38	<20	36
21	<20	38	<20	38
22	<20	38	<20	38
18	<20	39	<20	38
20	<20	40	<20	39
61*	<20	40	<20	39
14	<20	39	<20	39
19	<20	40	<20	39
16*	<20	41	<20	39
23	<20	35	<20	35
35*	<20	35	<20	35
42*	<20	35	<20	35
37	<20	35	<20	35

* Measurement location

24 November 2017

Ref: 03012/7489

Matt Lord
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: OCTOBER 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Wednesday 11th October 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

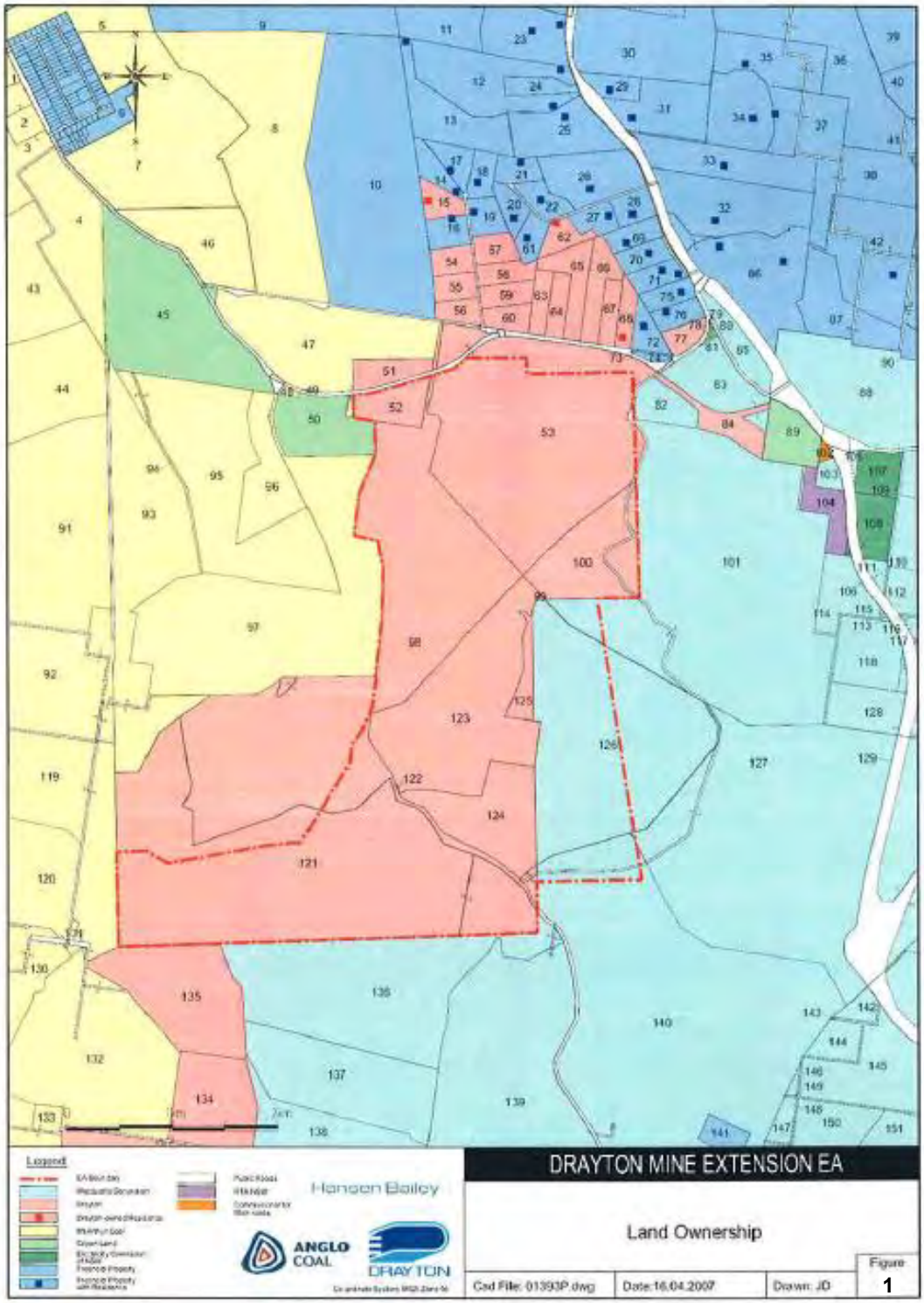
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not feasible to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Two sets of measurements were made over the "circuit", one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were inaudible at all monitoring locations throughout the evening and night time periods.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date: 16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey. Where DCM is inaudible a value of <20 has been assigned to enable numerical comparison with noise criteria.

Table 2
DCM Noise Monitoring Results – 11 October 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	6:56 pm	38	3.1 / 110	Traffic (37), frogs (30), **DCM (<20)**
Kerr (37)	8:58 pm	62	2.6 / 127	Traffic (62), **DCM (<20)**
Skinner (40)	8:39 pm	40	2.6 / 127	Traffic (40), **DCM (<20)**
Robertson (37)	7:22 pm	52	3.1 / 110	Traffic (52), **DCM (<20)**
Sharman (35)	8:09 pm	54	2.6 / 127	Traffic (54), **DCM (<20)**
Horder (36)	7:50 pm	58	3.1 / 110	Dog (57), Traffic (45), **DCM (<20)**
Wilson (35)	9:26 pm	37	2.6 / 136	Traffic (37), **DCM (<20)**
Smith (35)	9:48 pm	36	2.6 / 136	Traffic (36), **DCM (<20)**

Table 3
DCM Noise Monitoring Results – 11/12 October 2017 (Night)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (39)	12:52 am	38	2.6 / 140	Traffic (38), Mine (25), **DCM (<20)**
Kerr (37)	11:04 pm	57	2.6 / 140	Traffic (57), **DCM (<20)**
Skinner (39)	11:26 pm	41	2.6 / 140	Traffic (41), **DCM (<20)**
Robertson (42)	12:30 am	51	2.6 / 140	Traffic (51), **DCM (<20)**
Sharman (41)	11:53 pm	53	2.6 / 140	Traffic (53), **DCM (<20)**
Horder (42)	12:12 am	39	2.6 / 140	Traffic (39), **DCM (<20)**
Wilson (36)	10:31 pm	37	2.6 / 140	Traffic (36), industry (26), **DCM (<20)**
Smith (36)	10:08 pm	39	2.6 / 140	Traffic (39), Industrial (27), **DCM (<20)**

Table 4 DCM Noise Monitoring Results – 11/12 October 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (39)	12:52 am	40	2.6 / 140	Traffic	n/a
Kerr (37)	11:04 pm	63	2.6 / 140	Traffic	n/a
Skinner (39)	11:26 pm	43	2.6 / 140	Traffic	n/a
Robertson (42)	12:30 am	55	2.6 / 140	Traffic	n/a
Sharman (41)	11:53 pm	57	2.6 / 140	Traffic	n/a
Horder (42)	12:12 am	42	2.6 / 140	Traffic	n/a
Wilson (36)	10:31 pm	39	2.6 / 140	Traffic	n/a
Smith (36)	10:08 pm	42	2.6 / 140	Traffic	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emissions were inaudible at all receiver locations.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

As DCM was inaudible, there are no applicable tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

As DCM operations were inaudible at all monitoring locations it can be extrapolated that DCM was inaudible at all receiver locations listed in the DCM Project Approval.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington, MAAS
Acoustical Consultant

Review:

Ross Hodge, MAAS
Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)				
Location	Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal
34	<20	35	<20	39
29	<20	35	<20	36
31	<20	35	<20	37
33	<20	35	<20	38
86	<20	35	<20	38
32	<20	35	<20	40
71	<20	35	<20	41
75*	<20	35	<20	41
70	<20	36	<20	41
76*	<20	36	<20	42
28	<20	37	<20	40
69	<20	37	<20	41
13	<20	36	<20	35
12	<20	36	<20	36
25*	<20	37	<20	37
26	<20	37	<20	38
27	<20	37	<20	39
72*	<20	37	<20	42
17	<20	38	<20	36
21	<20	38	<20	38
22	<20	38	<20	38
18	<20	39	<20	38
20	<20	40	<20	39
61*	<20	40	<20	39
14	<20	39	<20	39
19	<20	40	<20	39
16*	<20	41	<20	39
23	<20	35	<20	35
35*	<20	35	<20	35
42*	<20	35	<20	35
37	<20	35	<20	35

* Measurement location

9 January 2018

Ref: 03012/7583

Matt Lord
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: NOVEMBER 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Friday 24th November 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not feasible to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
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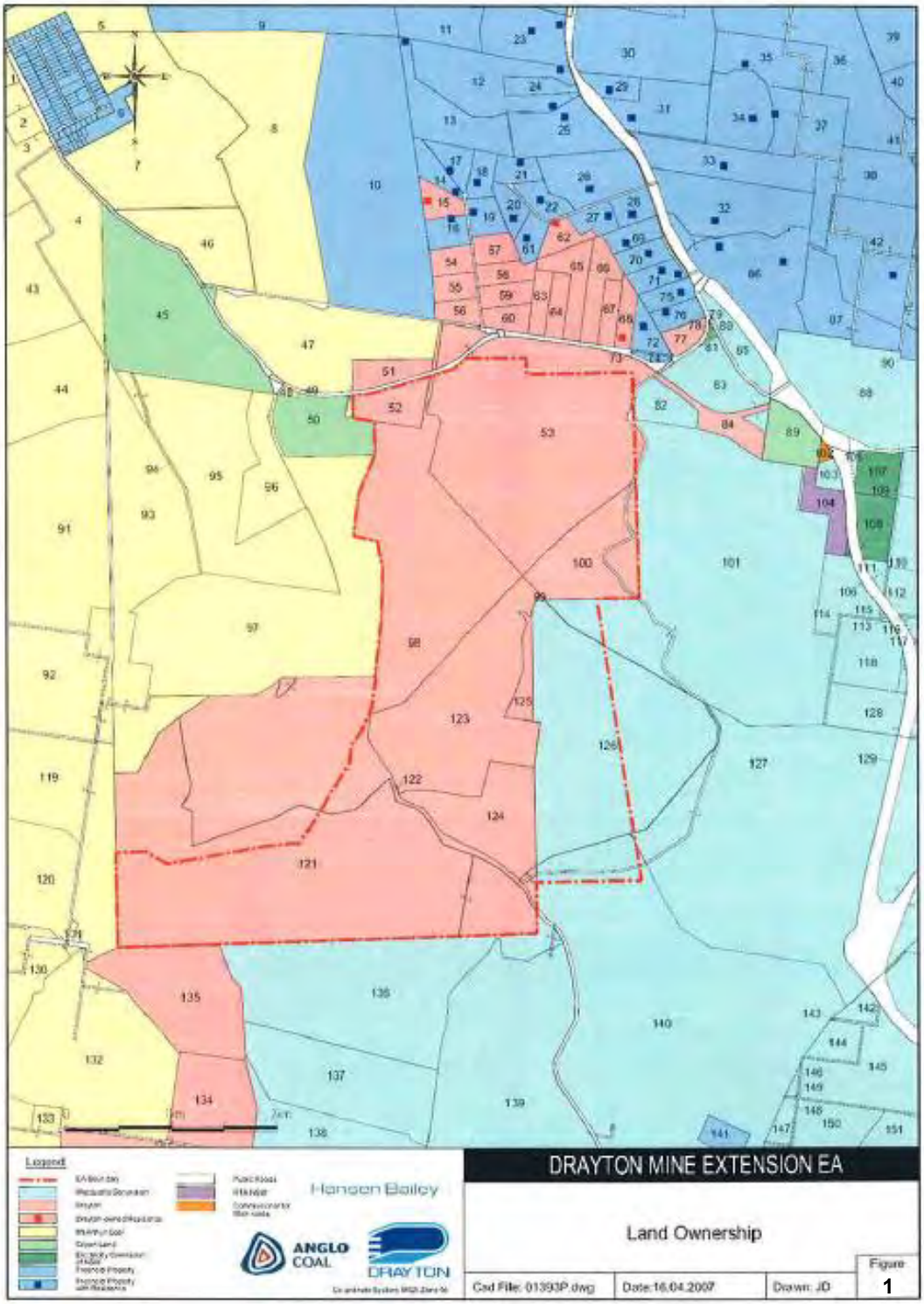
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Two sets of measurements were made over the "circuit", one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were inaudible at all monitoring locations throughout the evening and night time periods.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date: 16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey. Where DCM is inaudible a value of <20 has been assigned to enable numerical comparison with noise criteria.

Table 2
DCM Noise Monitoring Results – 24 November 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	7:04 pm	41	0.9 / 172	Insects (39), mine (33), plane (31), **DCM (<20)**
Kerr (37)	9:07 pm	57	2.2 / 128	Traffic (57), **DCM (<20)**
Skinner (40)	8:49 pm	40	1.7 / 127	Traffic (37), mine (36), **DCM (<20)**
Robertson (37)	7:33 pm	53	0.9 / 172	Traffic (52), insects (43), **DCM (<20)**
Sharman (35)	8:17 pm	57	1.7 / 127	Traffic (56), insects (47), **DCM (<20)**
Horder (36)	7:58 pm	40	0.9 / 172	Traffic (38), mine (33), frogs (30), **DCM (<20)**
Wilson (35)	9:34 pm	45	2.2 / 128	Insects (44), traffic (35), **DCM (<20)**
Smith (35)	9:57 pm	38	2.2 / 128	Traffic (35), insects (31), industry (30), **DCM (<20)**

Table 3
DCM Noise Monitoring Results – 24/25 November 2017 (Night)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (39)	12:57 am	41	0.8 / 178	Insects (40), traffic (32), **DCM (<20)**
Kerr (37)	11:08 pm	60	0.8 / 178	Traffic (60), **DCM (<20)**
Skinner (39)	11:32 pm	48	0.8 / 178	Traffic (47), insects (41), **DCM (<20)**
Robertson (42)	12:35 am	52	0.8 / 178	Traffic (50), insects (46), **DCM (<20)**
Sharman (41)	11:57 pm	50	0.8 / 178	Traffic (49), insects (42), **DCM (<20)**
Horder (42)	12:17 am	39	0.8 / 178	Traffic (36), insects (33), mine (31), **DCM (<20)**
Wilson (36)	10:37 pm	45	1.4 / 167	Insects (43), traffic (38), **DCM (<20)**
Smith (36)	10:14 pm	38	1.4 / 167	Traffic (35), insects (34), **DCM (<20)**

Table 4 DCM Noise Monitoring Results – 24/25 November 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (39)	12:57 am	44	0.8 / 178	Traffic	n/a
Kerr (37)	11:08 pm	71	0.8 / 178	Traffic	n/a
Skinner (39)	11:32 pm	54	0.8 / 178	Traffic	n/a
Robertson (42)	12:35 am	58	0.8 / 178	Traffic	n/a
Sharman (41)	11:57 pm	65	0.8 / 178	Traffic	n/a
Horder (42)	12:17 am	46	0.8 / 178	Traffic	n/a
Wilson (36)	10:37 pm	46	1.4 / 167	Traffic	n/a
Smith (36)	10:14 pm	43	1.4 / 167	Traffic	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emissions were inaudible at all receiver locations.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

As DCM was inaudible, there are no applicable tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

As DCM operations were inaudible at all monitoring locations it can be extrapolated that DCM was inaudible at all receiver locations listed in the DCM Project Approval.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington MAIP, MAAS

Acoustical Consultant

Review:

Ross Hodge MAAS

Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)				
Location	Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal
34	<20	35	<20	39
29	<20	35	<20	36
31	<20	35	<20	37
33	<20	35	<20	38
86	<20	35	<20	38
32	<20	35	<20	40
71	<20	35	<20	41
75*	<20	35	<20	41
70	<20	36	<20	41
76*	<20	36	<20	42
28	<20	37	<20	40
69	<20	37	<20	41
13	<20	36	<20	35
12	<20	36	<20	36
25*	<20	37	<20	37
26	<20	37	<20	38
27	<20	37	<20	39
72*	<20	37	<20	42
17	<20	38	<20	36
21	<20	38	<20	38
22	<20	38	<20	38
18	<20	39	<20	38
20	<20	40	<20	39
61*	<20	40	<20	39
14	<20	39	<20	39
19	<20	40	<20	39
16*	<20	41	<20	39
23	<20	35	<20	35
35*	<20	35	<20	35
42*	<20	35	<20	35
37	<20	35	<20	35

* Measurement location

7 February 2018

Ref: 03012/7584

Matt Lord
Anglo Coal (Drayton Management) Pty Limited
PMB 9
Muswellbrook NSW 2333

RE: DECEMBER 2017 NOISE MONITORING RESULTS

This letter report presents the results of noise compliance monitoring conducted for the Drayton Coal Mine (DCM) on Thursday 14th December, 2017. The purpose of the measurements was to quantify the overall noise levels at the nearby residences and determine the contribution from DCM operations.

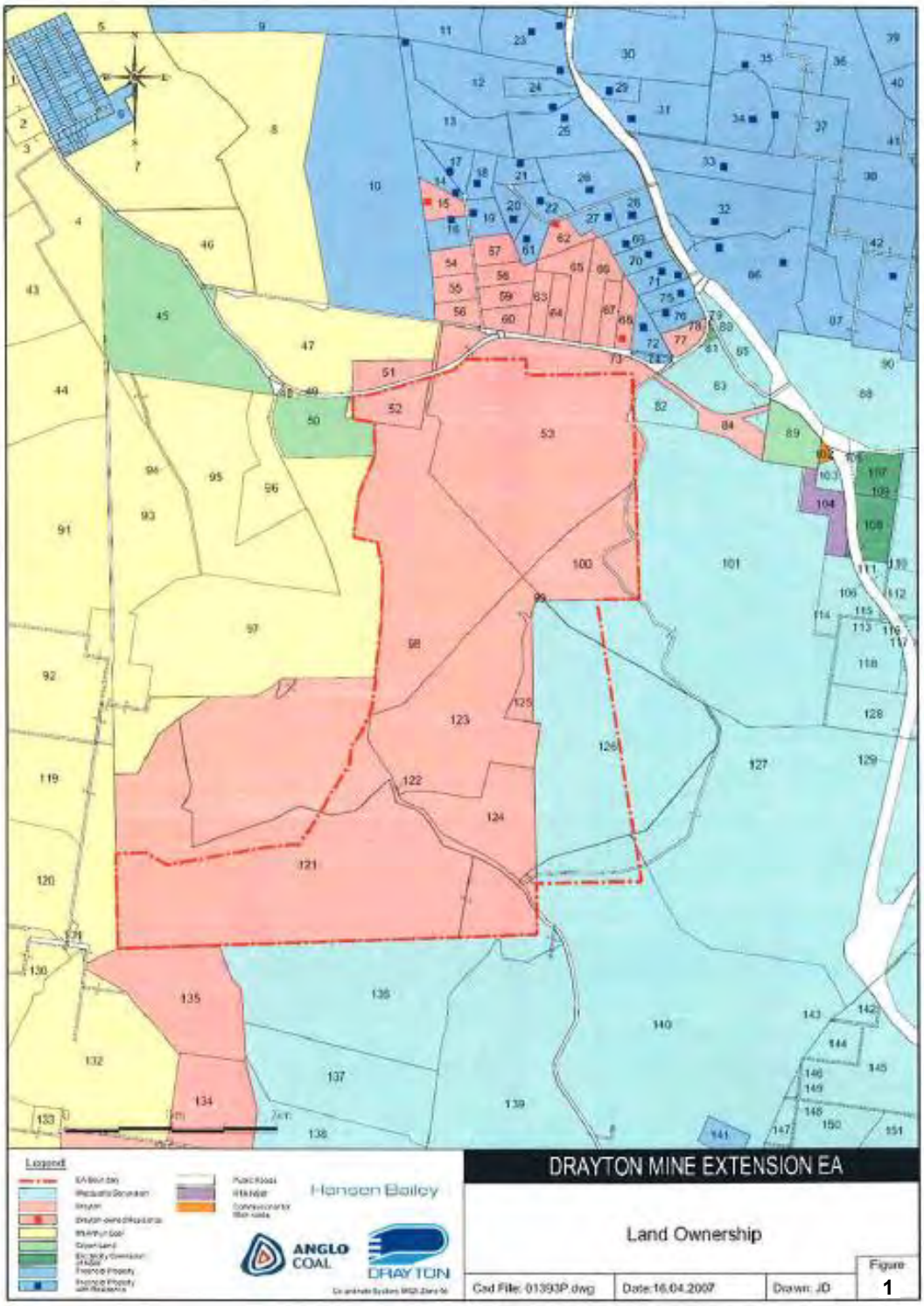
Schedule 3 of the DCM Project Approval details noise impact assessment criteria for 28 specific residential locations. For logistic reasons it is not reasonable to carry out attended noise monitoring at all of the listed locations during the one monitoring survey. As such, the approach taken was to monitor the noise at eight representative residential locations and determine, by noise modelling, the noise level at all of the other locations required in the Project Approval. Noise measurement locations for the attended noise survey are listed below (as shown in **Figure 1**):

Location R16: Doherty
Location R25: Kerr
Location R35: Wilson*
Location R42: Smith*
Location R61: Skinner
Location R72: Robertson**
Location R75: Sharman**
Location R76: Horder

* Additional locations contained in EPL 1323 but not in the Project Approval.
** Monitoring conducted at front gate of property at Landowners request.

Three sets of measurements were made over the "circuit", one during the day time period (before 6 pm), one during the evening period (from 6 pm – 10 pm) and one at night (after 10 pm). DCM activities were inaudible at all locations throughout the survey.

Meteorological data used in this report was supplied by the mine from their automatic weather station. Wind speeds (in m/s) and direction have been determined as the arithmetic average of the measurements over the monitoring period. The mine operated weather station does not record temperature inversion data.


DRAYTON MINE EXTENSION EA
Land Ownership
Hansen Bailey
ANGLO COAL
DRAYTON
Cad File: 01393P.dwg
Date: 16.04.2007
Drawn: JD
Figure
1

Details of the DCM Project Approval with respect to noise emissions are shown as **Appendix A** to this report.

Noise emission levels were measured with Brüel & Kjær Type 2250 Precision Sound Analysers. These instruments have Type 1 characteristics as defined in AS1259-1982 "Sound Level Meters". Calibration of the instruments was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements.

Measured noise levels for each monitoring circuit are summarised in the following tables. The total measured L_{eq} is shown in **Tables 1-3** and night time $L_{1(1minute)}$ – approximated as measured L_{max} – in **Table 4**. Table 3 shows the overall $L_{1(1minute)}$ and the contributing source as well as the $L_{1(1minute)}$ from DCM, where this was measurable.

Data were analysed with the Bruel & Kjaer "*Evaluator*" software to quantify the contributions of the various noise source(s) to the overall. The noise sources are listed in the comments column with the contribution of each shown in brackets. The noise goal (criterion) for mining operations at DCM is variable depending upon the location (as per the table from Schedule 3 shown in Appendix A). The relevant criterion is shown in brackets in the "Location" column in the tables. The contribution of mine noise from DCM is shown in bold. Any exceedances of the EPL and project approval noise criteria are shaded grey.

Table 1
DCM Noise Monitoring Results – 14 December 2017 (Day)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	3:05 pm	39	2.3 / 258	Birds (38), traffic (31), **DCM (<20)**
Kerr (36)	4:57 pm	52	1.1 / 270	Traffic (52), birds (36), **DCM (<20)**
Skinner (39)	4:38 pm	37	1.4 / 196	Birds (36), traffic (27), **DCM (<20)**
Robertson (36)	3:25 pm	50	1.4 / 121	Traffic (50), birds & insects (38), **DCM (<20)**
Sharman (35)	4:08 pm	54	2.7 / 282	Traffic (54), birds & insects (36), **DCM (<20)**
Horder (35)	3:48 pm	48	1.5 / 248	Birds & insects (46),traffic (42), **DCM (<20)**
Wilson (35)	5:22 pm	42	1.5 / 264	Traffic (41), birds (35), **DCM (<20)**
Smith (35)	5:43 pm	44	1.4 / 270	Birds & insects (43), traffic (36), **DCM (<20)**

Table 2
DCM Noise Monitoring Results – 14 December 2017 (Evening)

Location (Criterion)	Time	dB(A), $L_{eq(15min)}$	Wind speed/ direction	Identified Noise Sources
Doherty (41)	6:39 pm	38	1.2 / 302	Birds (35), traffic (30), mine (28), **DCM (<20)**
Kerr (37)	8:41 pm	51	0.7 / 318	Traffic (51), **DCM (<20)**
Skinner (40)	8:22 pm	40	Calm	Birds & insects (38), traffic (34), **DCM (<20)**
Robertson (37)	7:06 pm	51	1.0 / 316	Traffic (50), birds & insects (42), **DCM (<20)**
Sharman (35)	7:55 pm	55	Calm	Traffic (55), insects (38), **DCM (<20)**
Horder (36)	7:32 pm	45	0.9 / 298	Birds & insects (42), traffic (40), **DCM (<20)**
Wilson (35)	9:11 pm	45	1.4 / 299	Insects (43), traffic (39), **DCM (<20)**
Smith (35)	9:32 pm	40	0.8 / 287	Insects (38), traffic (33), **DCM (<20)**

Table 3 DCM Noise Monitoring Results – 14 December 2017 (Night)				
Location (Criterion)	**Time**	**dB(A), $L_{eq(15min)}$**	**Wind speed/ direction**	**Identified Noise Sources**
Doherty (39)	12:44 am	43	0.6 / 211	Insects (40), traffic (37), **DCM (<20)**
Kerr (37)	10:54 pm	51	0.9 / 303	Traffic (51), **DCM (<20)**
Skinner (39)	11:16 pm	43	0.9 / 310	Frogs (43), traffic (32), **DCM (<20)**
Robertson (42)	12:22 am	45	1.0 / 280	Traffic (43), insects (40), **DCM (<20)**
Sharman (41)	11:44 pm	49	1.0 / 302	Traffic (48), insects (39), **DCM (<20)**
Horder (42)	12:03 am	44	0.8 / 319	Frogs & insects (43), traffic (34), **DCM (<20)**
Wilson (36)	10:23 pm	48	1.1 / 311	Insects (48), traffic (37), **DCM (<20)**
Smith (36)	10:00 pm	45	1.0 / 336	Insects (44), traffic (33), **DCM (<20)**

Table 4 DCM Noise Monitoring Results – 14 December 2017 (Night)					
Location (Criterion)	**Time**	**dB(A), $L_{1(1minute)}$**	**Wind speed/ direction**	**L_{A1} source**	**Identified Mine Sources ($L_{1\ (1\ min)}$)**
Doherty (47)	12:44 am	45	0.6 / 211	Insects	n/a
Kerr (47)	10:54 pm	62	0.9 / 303	Highway	n/a
Skinner (47)	11:16 pm	46	0.9 / 310	Frogs	n/a
Robertson (47)	12:22 am	52	1.0 / 280	Traffic	n/a
Sharman (47)	11:44 pm	57	1.0 / 302	Highway	n/a
Horder (47)	12:03 am	48	0.8 / 319	Frogs	n/a
Wilson (47)	10:23 pm	51	1.1 / 311	Insects	n/a
Smith (47)	10:00 pm	47	1.0 / 336	Insects	n/a

The results in Tables 1 to 3 show that the applicable operational noise criteria were not exceeded at any location or at any time throughout the monitoring survey. DCM noise emission were inaudible at all receiver locations.

Data from those times where DCM operations were audible were analysed using the *"Evaluator"* software. This analysis showed the noise did not contain any tonal, impulsive or low frequency components as per definitions in the NSW Industrial Noise Policy.

The results in Table 4 show that the sleep disturbance criteria ($L_{1(1minute)}$) was not exceeded at any monitoring location during the night time period.

Since the mine is not operational, there is no noise contribution and a value of <20 dB(A) is attributed for each of the listed residential locations with results shown in **Appendix B** for completeness.

As the $L_{1(1minute)}$ levels were well below the sleep disturbance criterion at the attended monitoring locations, no modelling of $L_{1(1minute)}$ levels was conducted for other receiver locations, as these are all at greater distance from the DCM.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

Neil Pennington MAIP, MAAS
Acoustical Consultant

Review:

Ross Hodge MAAS
Acoustical Consultant

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Noise Impact Assessment Criteria

1. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land, or on more than 25 percent of any privately-owned land.

Table 1: Noise impact assessment criteria dB(A)

Land Number	Day	Evening	Night	
	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{Aeq(15\ min)}$	$L_{A1(1\ min)}$
34	35	35	36	45
29	35	35	36	47
31	35	35	37	47
33, 86	35	35	38	45
32	35	35	40	47
71, 75	35	35	41	47
70	35	36	41	47
76	35	36	42	47
28	35	37	40	47
69	35	37	41	47
13	36	36	35	45
12	36	36	36	47
25	36	37	37	47
26	36	37	38	47
27	36	37	39	47
72	36	37	42	47
17	37	38	36	47
21, 22	38	38	38	45
18	38	39	38	47
20, 61	39	40	39	45
14	40	39	38	47
19	40	40	39	47
16	41	41	39	47
23	35	35	35	47
All other privately-owned land	35	35	35	45

However, if the Proponent has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and DECC, then the Proponent may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.

Notes:

- *For information on the numbering and identification of properties used in this approval, see Appendix 5.*
- *To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, noise from the project is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *To determine compliance with the $L_{A1(1\ minute)}$ noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DECC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).*

- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *temperature inversion conditions of up to 3°C/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

Land Acquisition Criteria

2. If the noise generated by the project exceeds the criteria in Table 2 at any residence on privately-owned land or on more than 25 percent of any privately-owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 8-10 of Schedule 4.

Table 2: Land acquisition criteria dB(A)

Land Number	***Day/Evening/Night*** $L_{Aeq(15min)}$
12, 14, 16, 17, 18, 19, 23, 25, 26, 27, 28, 29, 31, 32, 69, 70, 71, 72, 75, 76	42
All other private land owners not listed in Table 1, or on more than 25 percent of, any privately owned land.	40

Note: Noise generated by the project is to be measured in accordance with the notes to Table 1.

Cumulative Noise Criteria

3. The Proponent shall take all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by other mines does not exceed the following amenity criteria at any residence on privately-owned land or on more than 25 percent of any privately owned land:
   - $L_{Aeq(11\ hour)}$ *50 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *45 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *40 dB(A) – Night.*

4. If the noise generated by the project combined with the noise generated by other mines exceeds the following amenity criteria at any residence on privately owned-land or on more than 25 percent of any privately owned land, then upon receiving a written request from the landowner, the Proponent shall acquire the land on as equitable basis as possible with the relevant mines in accordance with the procedures in conditions 8-10 of Schedule 4:
   - $L_{Aeq(11\ hour)}$ *53 dB(A) – Day;*
   - $L_{Aeq(4\ hour)}$ *48 dB(A) – Evening;*
   - $L_{Aeq(9\ hour)}$ *43 dB(A) – Night.*

Notes: The cumulative noise generated by the project combined with the noise generated by other mines is to be measured in accordance with the relevant procedures in the NSW Industrial Noise Policy.

APPENDIX B MODELLED NOISE LEVELS as Leq (15 min)						
Location	Day		Evening		Night	
	Noise Level	Noise Goal	Noise Level	Noise Goal	Noise Level	Noise Goal
34	<20	35	<20	35	<20	39
29	<20	35	<20	35	<20	36
31	<20	35	<20	35	<20	37
33	<20	35	<20	35	<20	38
86	<20	35	<20	35	<20	38
32	<20	35	<20	35	<20	40
71	<20	35	<20	35	<20	41
75*	<20	35	<20	35	<20	41
70	<20	35	<20	36	<20	41
76*	<20	35	<20	36	<20	42
28	<20	35	<20	37	<20	40
69	<20	35	<20	37	<20	41
13	<20	36	<20	36	<20	35
12	<20	36	<20	36	<20	36
25*	<20	36	<20	37	<20	37
26	<20	36	<20	37	<20	38
27	<20	36	<20	37	<20	39
72*	<20	36	<20	37	<20	42
17	<20	37	<20	38	<20	36
21	<20	38	<20	38	<20	38
22	<20	38	<20	38	<20	38
18	<20	38	<20	39	<20	38
20	<20	39	<20	40	<20	39
61*	<20	39	<20	40	<20	39
14	<20	40	<20	39	<20	39
19	<20	40	<20	40	<20	39
16*	<20	41	<20	41	<20	39
23	<20	35	<20	35	<20	35
35*	<20	35	<20	35	<20	35
42*	<20	35	<20	35	<20	35
37	<20	35	<20	35	<20	35

* Measurement location

Appendix I: Annual Flora and Fauna Monitoring Report

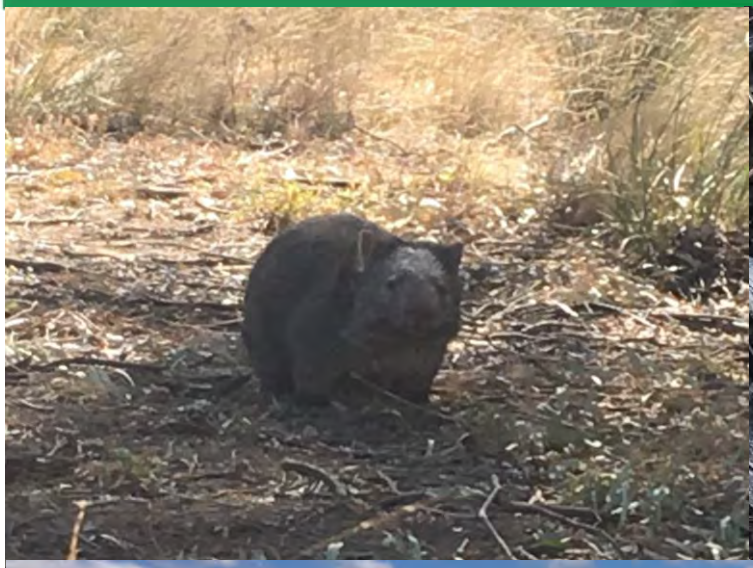
(refer attached report)

Drayton Coal

2017 Spring Biodiversity Monitoring Report

Prepared for
Anglo Coal (Drayton Management) Pty Ltd

November 2017



DOCUMENT TRACKING

Item	Detail
Project Name	2017 Spring Biodiversity Monitoring Report
Project Number	17NEW-7411
Project Manager	Sarah Stevens 02 4910 3414 Suite 28&29, Level 7, 19 Bolton Street Newcastle, NSW, 2300
Prepared by	Sarah Stevens
Reviewed by	Daniel Magdi
Approved by	Martin Sullivan
Status	FINAL
Version Number	1
Last saved on	29 November 2017
Cover photo	*Vombatidae* (young Wombat), *Calotis cuneifolia* (Blue Burr-Daisy), north of the southern offset – pasture and *Swainsona galegifolia* (The Darling Pea). Elira Reynolds, September 2017

This report should be cited as 'Eco Logical Australia 2017. *Spring Flora and Fauna Monitoring Report*. Prepared for Anglo Coal (Drayton Management) Pty Ltd.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Matthew Lord of Drayton Coal

Contents

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Abbreviations

Abbreviation	Description
BC Act	Biodiversity Conservation Act 2016
DBH	Diameter at breast height
DEC	Department of Environment and Conservation (NSW)
ELA	Eco Logical Australia
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ROMP	Rehabilitation and Offset Management Plan

Executive summary

Eco Logical Australia (ELA) was commissioned by Drayton Coal Mine to conduct the annual 2017 spring biodiversity monitoring. The biodiversity monitoring program was guided by the survey methods provided in the Rehabilitation and Offset Management Plan, consistent with the monitoring programs carried out between 2013 and 2016. Drayton Coal Mine has an obligation under the approved Rehabilitation and Offset Management Plan to conduct environmental monitoring of biodiversity offset areas as well as rehabilitated land.

Of the 29 sites monitored in spring 2016 27 were included in the 2017 monitoring program due to AngloAmerican no longer own part of the Far East Tip. Of the 27 monitoring sites, seven of eight of the previously monitored sites were surveyed for fauna, and all sites were surveyed via floristic and biometric sampling methods. The flora and fauna monitoring data collected during the monitoring program was used to evaluate the performance of each of the monitoring sites against the key performance indicators specified in the Rehabilitation and Offset Management Plan. The Rehabilitation and Offset Management Plan performance indicators were revised by Anglo American in 2015, and thus 2017 represents the second year of monitoring for a number of the indicators. Each site type (natural vegetation, woodland rehabilitation and pasture rehabilitation) has different criteria specified in the Rehabilitation and Offset Management Plan.

For each of the key performance indicators, targets have been developed to evaluate site performance. These targets are generally based on averages of the data from reference (natural vegetation) sites across the five years of monitoring. The Performance Criteria Target is based on a five year target from when monitoring began, whilst the Completion Criteria Target is the end target for the monitoring sites. The performance criteria target is designed as an achievable short term target, which if met suggests the site is on a trajectory to meet its completion target.

Natural vegetation sites met all completion criteria targets in 2017 except one site that was found to have no midstorey and ground cover layers naturally regenerating.

Five out of ten sites are meeting the completion criteria targets for bare ground with no site exhibiting patches of more than 10m² across all sites. Less than half of the woodland rehabilitation sites are underperforming for canopy cover, shrub cover and native groundcover however all sites had seedlings observed of key species from all structural layers except the ground stratum. Tubestock losses greatly exceeded the target at all sites subject to planting. Of the woodland rehabilitation sites greater than five years old, three sites out of ten are meeting targets with regard to priority weed cover. All of the sites less than five years old are underperforming for total weed cover.

The majority of pasture rehabilitation monitoring sites are meeting the performance criteria target for effective cover of pasture species, although one has a very low pasture species cover. Two sites met the performance criteria target for target pasture species and none of the sites are currently meeting the targets with regard to diversity of perennial species. All of the pasture rehabilitation monitoring sites are meeting targets for priority weed cover. All pasture sites are underperforming in perennial diversity with three sites dominated by any pasture species that comprised 75-80% cover.

A total of 72 fauna species were recorded across all seven monitoring sites, including eight threatened species and three vertebrate pest species. Site 5a in the Southern Offset was the most diverse, with the highest number of native species. Site 9a, also in the Southern Offset, was the least diverse, having the least number of native species. Species richness was consistently higher at intact (analogue) sites

compared with rehabilitation sites as would be expected. Performance criteria were met at both natural vegetation sites and woodland rehabilitation with regard to native fauna and vertebrate pests.

Where sites are underperforming against the performance criteria targets, intervention is required. ELA has provided suggestions as to how to address shortfalls against targets for each site type.

Recommendations for land management within each monitoring area are given.

1 Introduction

1.1 Background

Drayton Coal Mine is located north east of Newcastle, approximately 13 km south west of Muswellbrook, NSW and has been in operation for approximately 30 years (AngloAmerican 2017) (**Figure 1**).

Eco Logical Australia (ELA) was engaged by Drayton Coal Mine to undertake the annual flora and fauna monitoring survey for spring 2017. The flora and fauna monitoring program was guided by the survey methods provided in the Rehabilitation and Offset Management Plan (ROMP; AngloAmerican 2013), consistent with the monitoring programs carried out from 2013-16. The methods applied are provided in **Section 2**.

1.1.1 Rehabilitation and Offset Areas

Surveys were conducted across the seven monitoring areas as identified in the ROMP, including:

- Drayton Wildlife Refuge;
- Northern Offset;
- Far East Tip;
- Southern Offset;
- Great North Tip;
- GeoFluv;
- South Tip.

1.2 Monitoring requirements

Drayton Coal Mine has an obligation under the approved ROMP to undertake environmental monitoring of biodiversity offset areas as well as rehabilitated land (AngloAmerican 2013).

1.3 Objectives and performance targets

The objectives of the monitoring are to:

- Identify specific problems to enable research on causes and appropriate solutions (e.g. loss of seedlings, low emergent numbers, and loss of particular species);
- Enable the assessment and management of impacts on biodiversity and rare species (e.g. weed invasion);
- Ascertain when the key performance indicators are being met in the rehabilitation areas;
- Provide feedback for continuous improvement of the rehabilitation program.

Table 1 provides the ROMP performance indicators for the sites monitored during 2016 and 2017. These performance indicators were revised by AngloAmerican in 2015, thus 2017 represents the second year of monitoring for a number of the performance indicators.

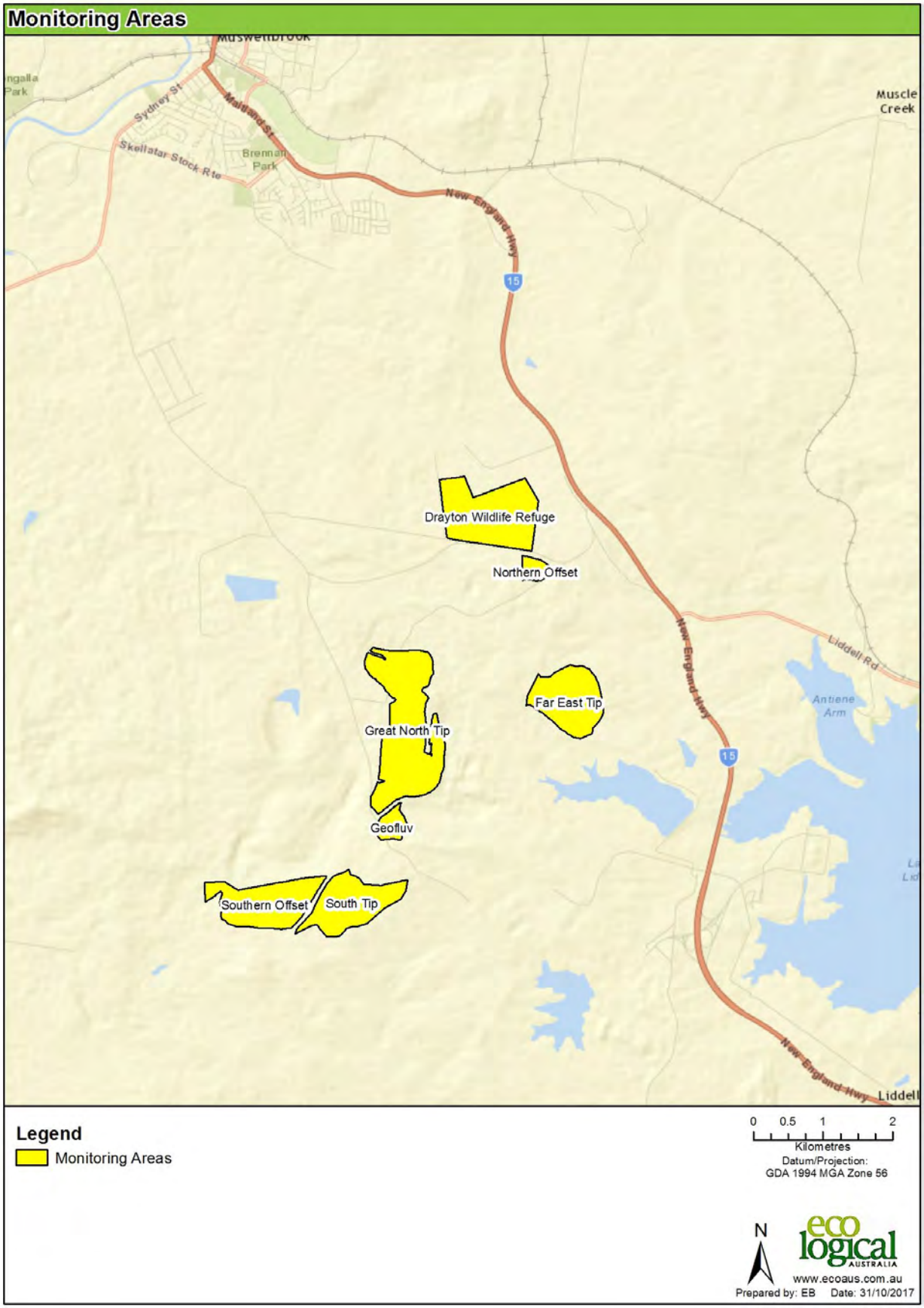

Figure 1: Monitoring areas

Table 1: Performance indicators by monitoring site type

Indicator	Pasture rehabilitation sites	Woodland rehabilitation sites	Natural vegetation sites
	Great North Tip sites 11a-11d Far East Tip sites 11h, 11i Geofluv site 11g South Tip site 11f	Southern Offset Area sites 6a-9a Great North Tip sites 10a, 10b, 10d, 10e	Northern Offset Area site 1c, 3c Drayton Wildlife Refuge sites 1a, 1b, 2a-3b, 4a Southern Offset Area remnant riparian site 5a
Ground cover	Effective cover of pasture species	Groundcover is established over all rehabilitated areas.	-
Community development / Species Mix	The mix of species in the area supports successful grazing practices.	The mix of species is similar to analogue areas and community description.	Natural areas are self-sustaining.
	Pasture is not dominated by one species.	Community structure (tree, shrub, understorey) approximates reference woodland sites.	
	Diversity of perennial species.	Community is self-sustaining.	
		Successful tube stock planting.	
Weeds	Weeds or non-target species form less than 20% of the species / cover present.	Weeds should be actively managed until desired vegetation is established.	Area should be free of listed noxious weed species and weeds of national significance.
Soil criteria	Soil parameters meet the recommended ranges.	-	-
Spontaneous combustion	Healthy vegetation with no evidence of spontaneous combustion impacts.	Healthy vegetation with no evidence of spontaneous combustion impacts.	-
Feral animal control	Evidence of feral animal species should not increase in abundance compared to analogue sites	Evidence of feral animal species should not increase in abundance compared to analogue sites.	Evidence of feral animal species should not indicate an increase in abundance.
Native fauna	-	Increase in numbers and species of native fauna as rehabilitation develops.	Abundance of native animals should not decrease.

2 Methodology

2.1 Survey team

Both flora and fauna surveys were undertaken between 4 and 9 September 2017 by ELA Ecologists Martin Sullivan, Tom Schmidt, Sarah Stevens and Elira Reynolds (qualifications provided in **Table 2**).

Table 2: ELA field team and qualifications

Staff	Role	Qualifications
Martin Sullivan	Senior Botanist	Bachelor of Science, Macquarie University
Tom Schmidt	Ecologist	Bachelor of Environmental Science and Management, University of Newcastle Bachelor of Environmental Science (Hons 1), Deakin University
Sarah Stevens	Graduate Ecologist	Bachelor of Environmental Science and Management, University of Newcastle
Elira Reynolds	Graduate Ecologist	Bachelor of Science (Conservation Biology), University of Wollongong Bachelor of Commerce, University of Wollongong Bachelor of Science (Honours – Biological Sciences), University of Wollongong

2.2 Monitoring site selection

Previously, 29 flora sites were monitored during the spring surveys, however, only 27 of these were included in the 2017 monitoring program as a portion of one of the sites (Far east tip) is no longer owned by AngloAmerican. Consistent with this slight reduction, seven of previously eight monitoring sites were surveyed for fauna. All sites were surveyed via floristic and biometric sampling methods. **Figures 2-5** provide the location of the monitoring sites.

Table 3: Vegetation types or target revegetation communities, monitoring area, site number

Biometric Type	Drayton Veg Type	Condition	Offset Area	Monitoring Sites
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin		Intact	Drayton Wildlife Refuge	1a (Fauna), 1b
			Northern offset	1c (Fauna)
		Derived Native Grassland (DNG)	Drayton Wildlife Refuge	2a
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin		Intact - Forest Red Gum Dominated	Drayton Wildlife Refuge	3a (Fauna), 3b (Fauna)
			Northern offset	3c
		Forest Red Gum Dominated - DNG	Drayton Wildlife Refuge	4a
		Intact - Yellow Box present	Southern offset	5a (Fauna)
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Narrow-leaved Ironbark Woodland	Rehab	Southern offset	6a
	Spotted Gum - Grey Box Open Forest Woodland	Rehab	Southern offset	7a, 7b
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	Forest Red Gum Open Forest Woodland	Rehab	Southern offset	8a, 8b
	Yellow Box - Grey Gum Woodland	Rehab	Southern offset	9a (fauna)
Woodland Rehab	Woodland	Rehab	Great North Tip	10a (fauna), 10b, 10d, 10e
Pasture Rehab	Pasture	Rehab	Great North Tip	11a, 11b, 11c, 11d
			Far east tip	11h, 11i
			South Tip	11f
			Geofluv	11g

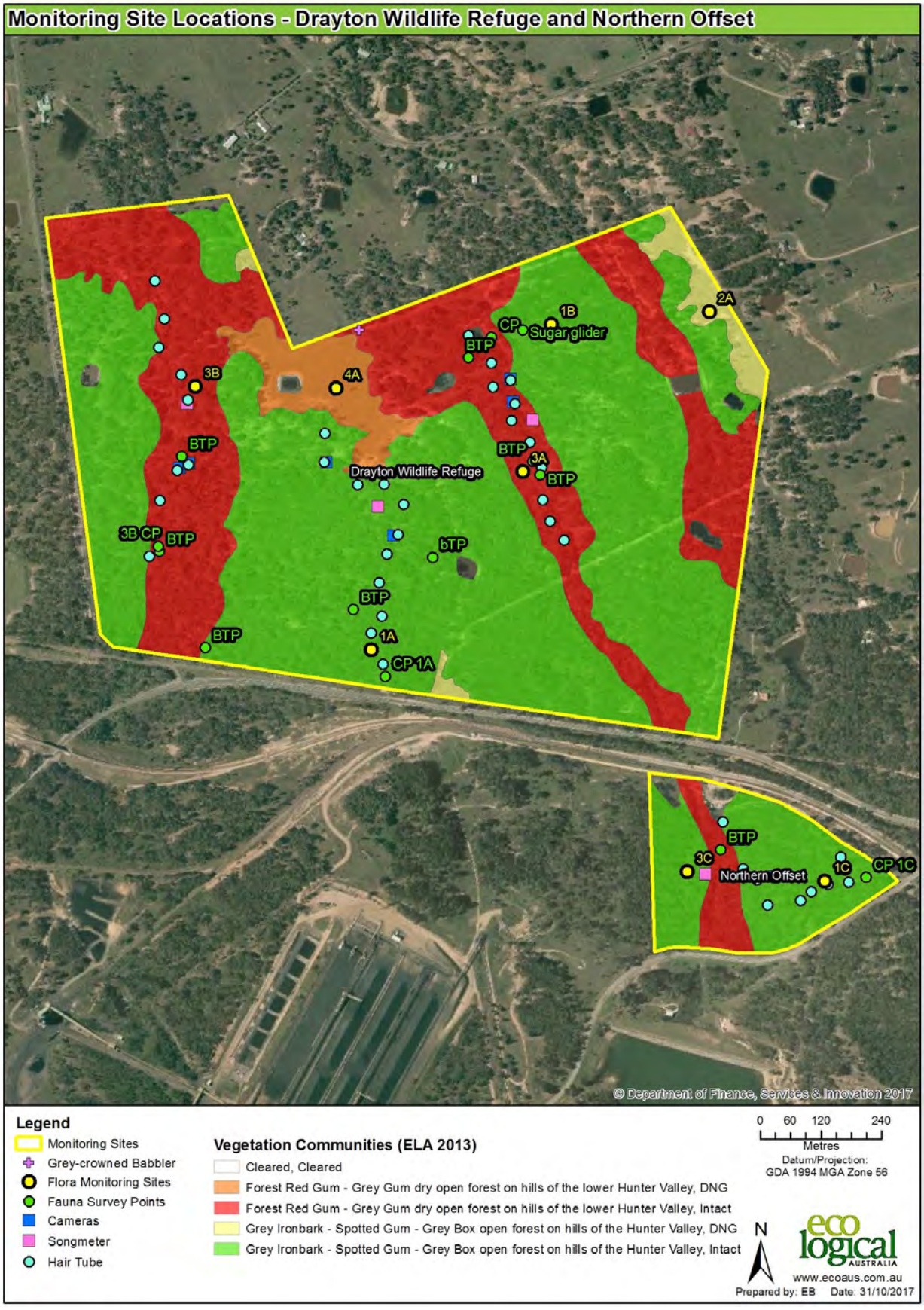

Figure 2: Northern Offset and Drayton Wildlife Refuge monitoring sites

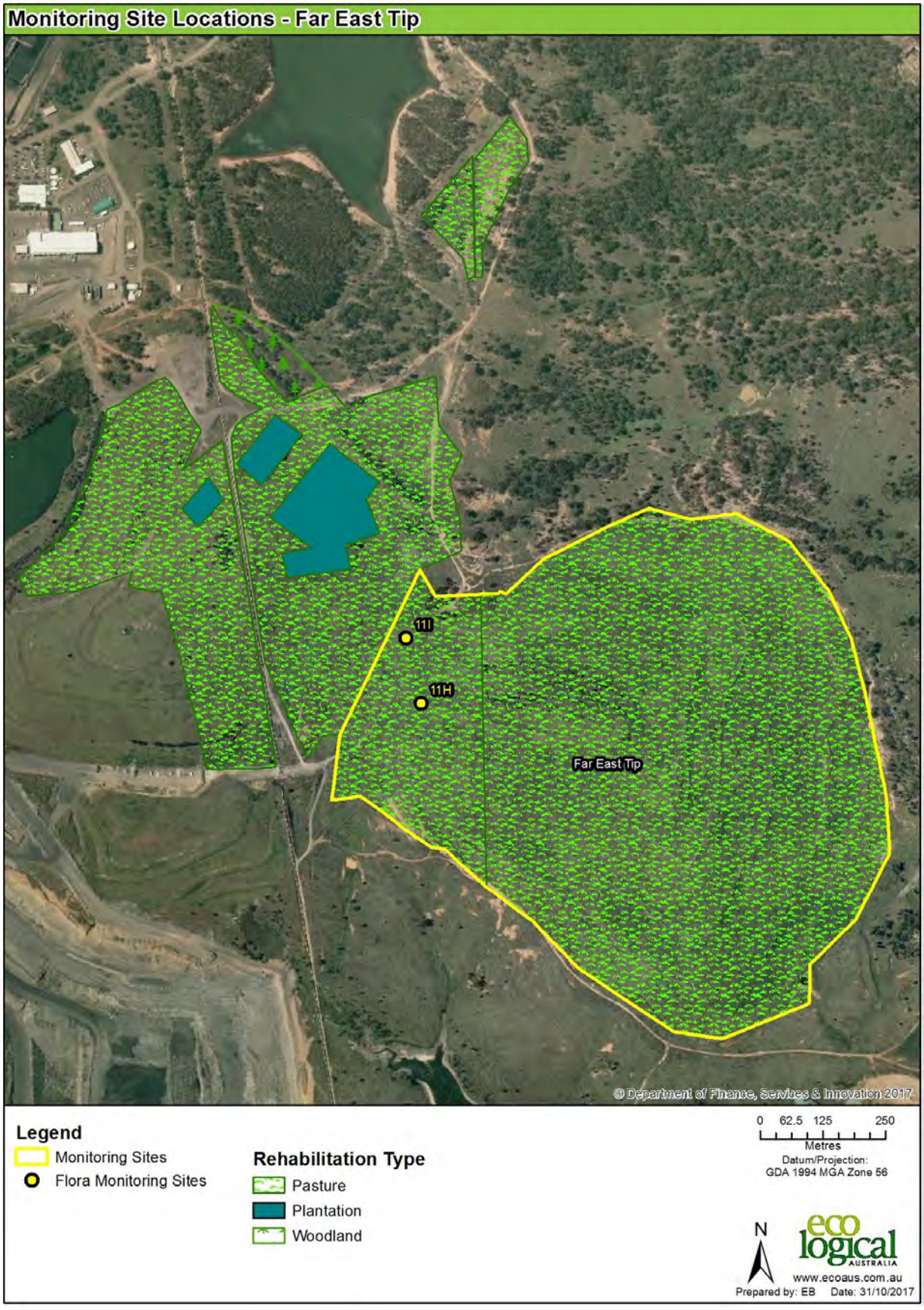

Figure 3: Far East Tip monitoring sites

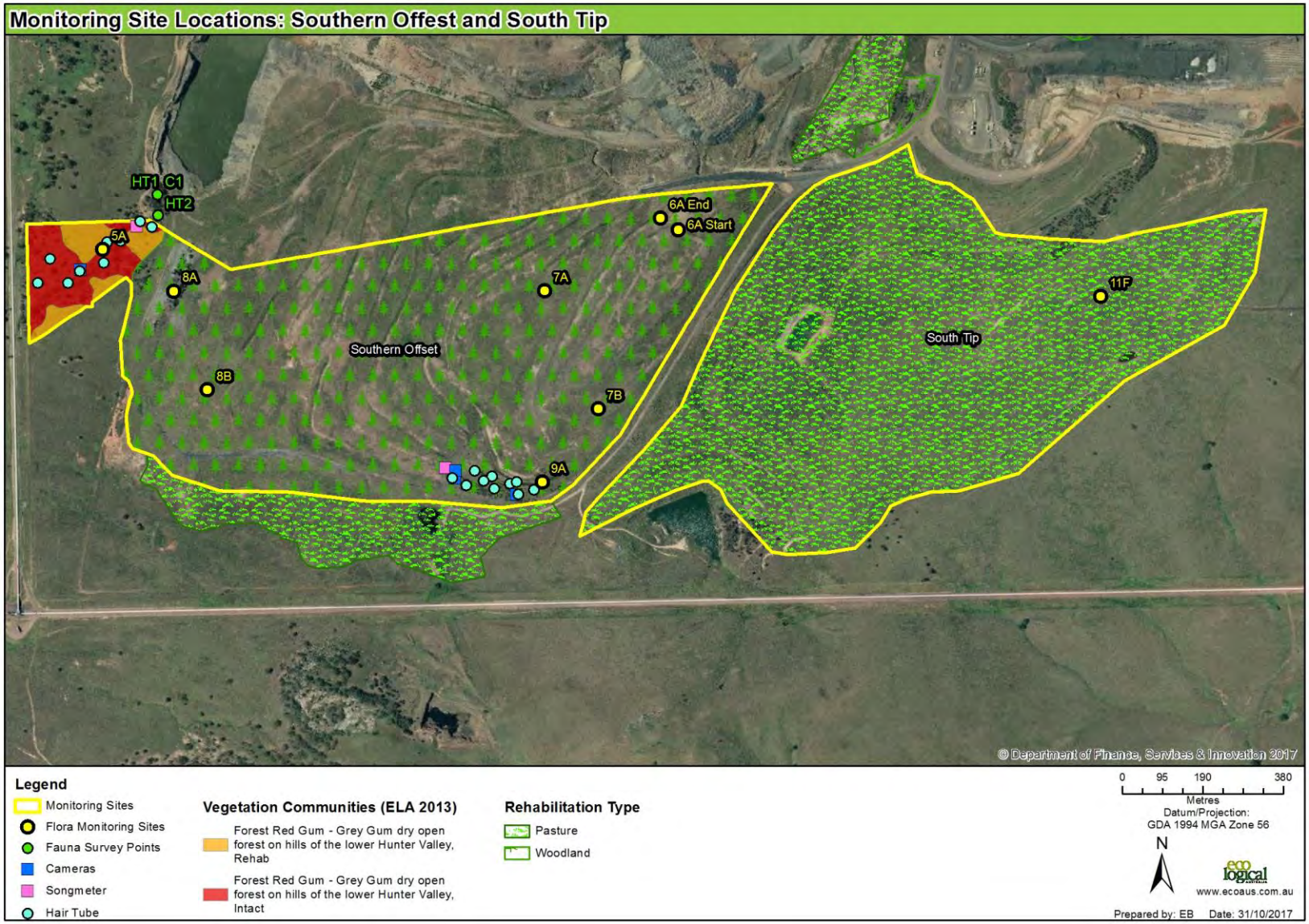

Figure 4: Southern Offset and South Tip monitoring sites

Figure 5: Great North Tip monitoring sites

2.3 Flora survey

The methodology used for sampling the 27 flora plots involved floristic and biometric parameters being recorded within a permanent 20 m x 50 m plot with a nested 20 m x 20 m full floristic plot (**Figure 6**). Note that the yellow squares are photo points looking towards the centre of the plot. A photograph was taken at both the start and end point (**Appendix C**).

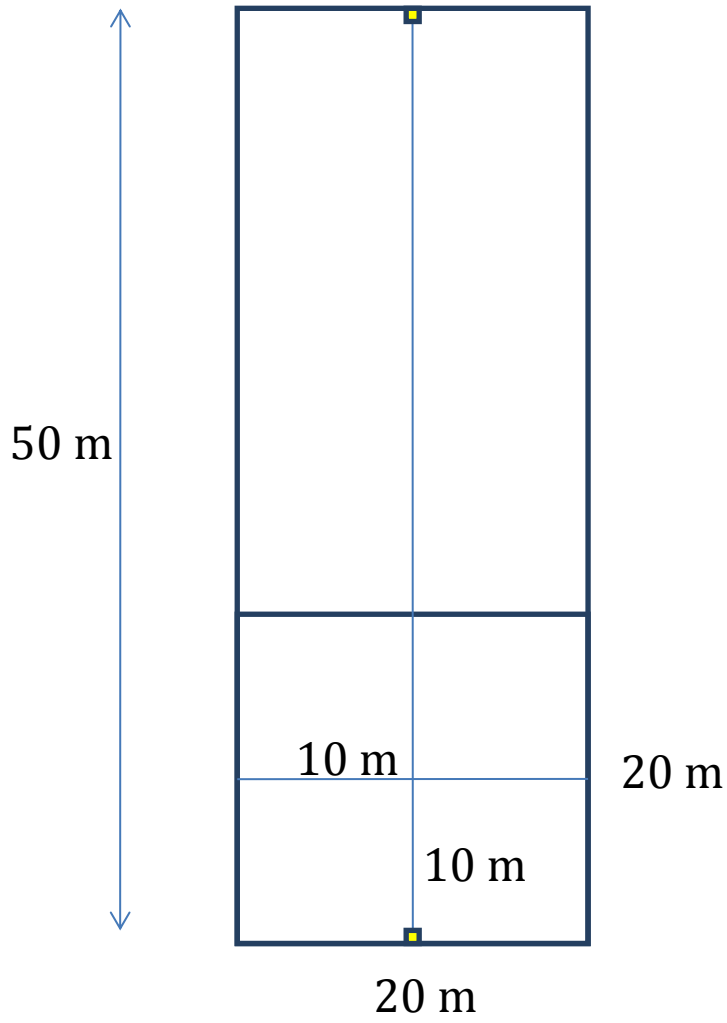

Figure 6: Floristic plot diagram

2.3.1 Full floristics

Full floristic surveys involved recording all plant species within a 0.04 ha plot (20 m x 20 m). The cover abundance of each species in the plot was also estimated, using a modified Braun-Blanquet scale as follows:

- 1 = few, small cover (<5%);
- 2 = numerous (<5%);
- 3 = 5 – 20%;
- 4 = 20 – 50%;
- 5 = 50 – 75%;
- 6 = >75%.

All vascular plant species were recorded and identified to the lowest taxonomic level possible, with samples of unknown species collected for further identification. Nomenclature followed the Flora of New South Wales (Harden 1992; 1993; 2000; 2002), and any subsequent recent taxonomic changes as presented on PlantNET (RBGDT 2016) and other specific botanical sources.

2.3.2 Biometric survey

Within the 20 m x 50 m plot, biometric attributes were recorded using the BioBanking Assessment Methodology (OEH 2017). Canopy cover and mid-storey cover (native and exotic) were recorded every five metres along the 50 m transect. Shrub cover, grass cover, other ground cover (herbs, forbs, sedges) and exotic ground cover were recorded at every one metre interval. Within the 20 m x 50 m plot, the total length of logs >10cm diameter, the number of hollow bearing trees and the presence of overstorey regeneration (of trees less than 5 cm DBH) were recorded.

2.3.3 Additional indicators

A number of additional indicators were collected depending on the type of monitoring site (natural vegetation, woodland rehabilitation or pasture rehabilitation).

Natural vegetation sites:

The natural vegetation sites in the Drayton Wildlife Refuge, Northern Offset and Southern Offset (sites 1a to 5a) required the following additional monitoring methodology in order to meet the requirements of the ROMP:

- Total cover of priority / nationally-significant weed species within the 20 x 20 m biometric plot at each site was estimated;
- For each key species in each structural layer, the presence/absence of regenerating seedlings within the site was noted.

Woodland rehabilitation sites:

For woodland rehabilitation sites (6a to 10b), the additional indicators specified below were collected:

- At every 1 m interval along the 50 m transect for the 50 m x 20 m plot for each site, the presence of any bare ground was recorded to allow calculation of % bare ground for the site. The presence of any bare patches > 10 m on site was also recorded;
- The species list compiled for each site during the collection of biometric data was compared with a list of planted species that are appropriate to the target vegetation community (provided by Drayton Coal Mine ; (**Appendix E**), and the percent of species on site that were target community species was calculated;
- The presence/absence of seedlings of the abovementioned target species was recorded;
- For sites established more than 5 years ago, the cover of priority weeds and weeds of national significance (WONS) in each plot was estimated;
- Approximate proportion of planting losses within each site was calculated (indicated by dead plantings).

Pasture rehabilitation sites:

For pasture rehabilitation sites (11a to 11g), the following additional data was collected:

- At every 1 m interval along the 50 m transect at each monitoring site, the presence / absence of a target pasture species (**Appendix F**) was recorded. This allowed calculation of the percentage cover of pasture species per site;

- To determine the percent of the species present that are target pasture species, the species list compiled for each site during the collection of biometric data was compared with the list of target species provided by Drayton Coal Mine;
- The cover of the dominant pasture species within the 20 x 20 m biometric plot at each site was estimated;
- To calculate the number of perennial species per m^2, four randomly placed 1 x 1 m quadrats were sampled per monitoring site. Within each site, the number of perennial pasture species was recorded and the mean calculated to obtain an overall figure for the site;
- The total cover of priority / national-significant weed species within the 20 x 20 m biometric plot at each site was estimated.

2.4 Fauna survey

Seven of the 27 monitoring sites (located in natural vegetation and woodland rehabilitation areas only) were sampled using the fauna survey methods below. Fauna monitoring was carried out as specified in the ROMP and is consistent with fauna monitoring completed since 2013.

2.4.1 Hair funnel and remote camera survey

At each fauna survey site, ten arboreal hair funnels were fixed to tree trunks at approximately 2 m height every 10–20 m along a marked transect. Each funnel contained bait constituting peanut butter, honey and oats, and the tree trunk above each funnel was sprayed with a honey-water mixture. A remote camera was placed at each site facing one of the ten arboreal hair funnels.

One terrestrial hair funnel baited with tuna was also placed on the ground along the transect, with a remote camera positioned so as to face the funnel.

All hair funnels were left on site for eight days and all hair samples were sent to Georgeanna Story from Scats About for analysis. Analysis of camera images included recording the species and the number of individuals observed.

2.4.2 Nocturnal survey

A spotlighting survey was conducted for one person-hour along the hair funnel transect at each site. 50 watt handheld spotlights were used to detect fauna by sight, and any fauna calls heard were also noted. All fauna species and the abundance of each species encountered were recorded.

At each site, a loudhailer was used to broadcast calls of the Squirrel Glider, Masked Owl, Powerful Owl, Barking Owl and Koala for five minutes for each species followed by ten minutes of quiet listening and five minutes spotlighting in the immediate vicinity.

2.4.3 Bird census

One songmeter (SM2BAT, Wildlife Acoustics) was set at each fauna monitoring site to record bird calls at dawn. Songmeter analysis was carried out by Tom Schmidt of ELA to identify all bird species present. When analysing the data for each site, a minimum 20 minute survey of all recorded bird species was carried out for one morning per site. Following the initial 20 minute listening period, each new species heard triggered a further five minutes of survey effort. This survey methodology is in accordance with the species-time curve approach described in the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004).

2.4.4 Herpetological survey

At each of the seven fauna monitoring sites, a 20 minute herpetological survey was completed. This involved watching for basking frogs or reptiles, turning logs and rocks, inspecting aquatic habitat and peeling bark off logs and trees. All species and their abundance were recorded.

2.4.5 Microchiropteran bats

At each of the eight monitoring sites, a songmeter (SM2 Bat model) was deployed for four nights, positioned along a potential flyway. A time delay was programmed such that the songmeters recorded calls from prior to dusk until after dawn. The first four hours of recordings for each night were analysed by Alicia Scanlon of ELA, and assigned to four levels of confidence as per Mills *et al.* (1996): definite, probable, possible, and unknown. Only definite call passes were used to represent species call activity.

2.5 Performance / Completion criteria targets

The flora and fauna monitoring data collected during the monitoring program was used to evaluate the performance of each of the monitoring sites against the key performance indicators specified in the ROMP. **Table 4** lists the key performance indicators and specifies the component of the flora and fauna monitoring program that addresses each indicator.

For each of the key performance indicators, targets have been developed to evaluate site performance. These targets are generally based on averages of the data from reference (natural vegetation) sites across the five years of monitoring. The performance and completion criteria target is based on a five year target from when monitoring began, whilst the Completion Criteria Target is the end target for the monitoring sites. The performance and completion criteria target is an achievable short term target (for sites 0-5 years old), which if met suggests the site is on a trajectory to meet its completion target.

Table 4: Key performance indicators, targets, and corresponding monitoring components by site type

Key Performance Indicator	Performance criteria (0-5 years)	Completion criteria (>5 years)	Relevant monitoring component
Natural vegetation sites			
Natural areas are self-sustaining	Evidence of self-seeded seedlings of target species in all structural layers	Evidence of self-seeded seedlings of target species in all structural layers	Presence/absence of regenerating seedlings of key species in each structural layer
Area should be free of listed noxious weed species and weeds of national significance	Total ground coverage of noxious and nationally significant weeds is <5%	Total ground coverage of noxious and nationally significant weeds is <5%	Priority weed species cover (%)
Abundance of native animals should not decrease.	No significant change in no. of species and abundance identified in fauna surveys.	No significant change in no. of species and abundance identified in fauna surveys.	Fauna monitoring
Evidence of feral animal species should not increase in abundance	Evidence of feral animal species not significantly greater than in analogue sites.	Evidence of feral animal species not significantly greater than in analogue sites.	Fauna monitoring
Woodland rehabilitation sites			
Overall cover for rehab areas is similar to analogue areas.	Ground cover is establishing evenly with no bare areas > 10 m^2	Ground cover has established evenly	Native ground cover (%), bare ground (%)
The mix of species is similar to analogue areas and community description.	Species emerging represent 80% of community species planted.	Enduring species represent 80% of community species planted.	Species list for each site compared with target planted species.
Weeds should be actively managed until desired vegetation is established.	Weeds form less than 20% of species / cover.	Total ground coverage of noxious and nationally significant weeds is <5%	Exotic species cover (%), priority weed cover (%)

Key Performance Indicator	Performance criteria (0-5 years)	Completion criteria (>5 years)	Relevant monitoring component
Healthy vegetation with no evidence of spontaneous combustion impacts.	No visible evidence of spontaneous combustion or vegetation impacts. No spontaneous combustion detected with thermal imaging.	No visible evidence of spontaneous combustion or vegetation impacts. No spontaneous combustion detected with thermal imaging.	Spontaneous combustion observations. Not relevant to this monitoring report.
Community structure (tree, shrub, understorey) approximates reference woodland sites.	Species emerging represent three structural layers of woodland community.	Community structure approximately 5% trees, 15% shrubs, 80% groundcover based on abundance. Understory average of 5 species / m2. Approximately 1 tree every 20m.	Native species diversity, canopy cover, shrub cover, native ground cover
Community is self-sustaining.	Seeded species are emerging and surviving.	Evidence of self-seeded seedlings of target species in all structural layers	Presence/absence of seedlings of target species in area
Successful tube stock planting	Percentage of plant losses should not exceed 10% of total plantings in any one planting area.	No further tube stock required.	Approx. % planting losses within site
Increase in numbers and species of native fauna as rehabilitation develops.	Fauna diversity and abundance approaching 40% of analogue sites.	Fauna diversity and abundance not significantly less than analogue sites.	Fauna monitoring
Evidence of feral animal species should not increase in abundance compared to analogue sites	Evidence of feral animal species not significantly greater than in analogue sites.	Evidence of feral animal species not significantly greater than in analogue sites.	Fauna monitoring
Pasture rehabilitation sites			
Effective cover of pasture species	Cover is showing an increase, up to 70% cover after 5 years.	Cover is 90 - 100%.	Pasture cover (%)

Key Performance Indicator	Performance criteria (0-5 years)	Completion criteria (>5 years)	Relevant monitoring component
The mix of species in the area supports successful grazing practices	All target species are establishing.	At least 80% of species present are target species.	Species list for each site compared with the list of target pasture species
Pasture is not dominated by one species.	Establishing species are showing an even mix in cover, no single species has a significantly higher abundance.	No single species represents more than 40% of cover.	Estimation of cover of dominant pasture species within biometric plot at each site
Diversity of perennial species	5-6 perennial species / m^2	7 or more perennial species / m^2	Mean no. of perennial species from 4 randomly placed quadrats
Weeds should be actively managed until desired vegetation is established and maintained.	Weeds form less than 20% of species / cover.	Total ground coverage of noxious and nationally significant weeds is <5%	Exotic species cover (%), priority weed cover (%)
Soil parameters meet the recommended ranges.	Key soil parameters vary from recommended ranges by <15%.	Annual soil monitoring shows soil parameters within recommended ranges.	Soil monitoring – included in a separate report.
Healthy vegetation with no evidence of spontaneous combustion impacts.	No visible evidence of spontaneous combustion or vegetation impacts. No spontaneous combustion detected with thermal imaging.	No visible evidence of spontaneous combustion or vegetation impacts. No spontaneous combustion detected with thermal imaging.	Spontaneous combustion observations. Not relevant to this monitoring report.
Evidence of feral animal species should not increase in abundance compared to analogue sites	Evidence of feral animal species not significantly greater than in analogue sites.	Evidence of feral animal species not significantly greater than in analogue sites.	Fauna monitoring

3 Results and discussion

3.1 Flora monitoring

Flora monitoring results are presented below by site type (natural vegetation, woodland rehabilitation and pasture rehabilitation), as each site type has different performance and completion indicators specified in the ROMP. Results from the 2017 monitoring are compared with each of the goals specified in the ROMP. Raw data is given in **Appendix B**. A brief summary of the results is shown in **Table 5** below.

Table 5: Summary of flora monitoring results

Monitoring site type	Performance indicator	Results
Natural vegetation sites	Natural areas are self-sustaining	All monitoring sites except 3a met the performance criteria target.
	Area should be free of listed priority weed species and weeds of national significance	All monitoring sites met the performance criteria target.
Woodland rehabilitation sites	Overall cover for rehab areas is similar to analogue areas	Five of the 10 sites are meeting the performance criteria target for bare ground. Sites 6a, 8b and 10a are sites that require intervention as a priority. No bare areas >10m^2 were present at any of the woodland monitoring sites.
	The mix of species is similar to analogue areas and community description.	Only site 9a has met the completion criteria with 7b and 8a slightly below however, most sites showed an increase since last year and all but two sites met the performance indicator.
	Community structure (tree, shrub, understory) approximates reference woodland sites	All sites are underperforming for natives species diversity with 7b and 10b reaching the highest diversity of half the completion criteria target. Sites 10a,10d and 10e are meeting the completion criteria target for canopy cover and are higher than 2016. Although no other sites have met the completion criteria, they are either higher than previous (9a) or consistent as previous years (6a-9a and 10b) Site 7b, 10b and 10e have met completion targets for midstorey cover. No sites meet the completion criteria for native grass cover, with 6% as the highest value.

		No sites meet the completion criteria for native ground cover, with 4% as the highest value.
	Weeds should be actively managed until desired vegetation is established.	Of the sites greater than 5 years old, 10a, 10b and 10d are meeting the completion criterion with regard to <5% priority weed cover. All of the sites less than 5 years old (6a, 7a, 7b, 8a, 8b, 9a and 10e) are underperforming against the performance criteria target.
	Community is self-sustaining	All sites had seedlings of key canopy species present, and sites 6a, 7b, 8a and 10e had seedlings of key midstorey species. No sites had seedlings of target ground layer species present, however this was consistent with the previous year.
	Successful tube stock planting	Tubestock losses greatly exceeded the completion criteria target at all sites subject to planting (sites 6a to 8b). This was consistent with performance criteria for 2016 also.
Pasture rehabilitation sites	Effective cover of pasture species	Sites 11b and 11c are meeting the completion criteria target, with all other sites (except 11f) relatively close in cover targets.
	The mix of species in the area supports successful grazing practices	No sites meet the completion criteria for this target, however, sites 11a, 11b, 11c, 11d, 11f and 11g are very near the performance criteria.
	Pasture is not dominated by one species.	Three out of eight sites meet the completion target ranging from 20-40% at sites 11b, 11f and 11g. Sites 11a and 11d were underperforming by only 10%. 11c, 11h and 11i comprised 75-80% of only one non-target species.
	Diversity of perennial species	None of the sites are currently meeting completion criteria targets with regard to diversity of perennial species, however, five sites have increased in diversity since 2016.
	Weeds should be actively managed until desired vegetation is established and maintained.	All monitoring sites are meeting completion criteria targets.

3.1.1 Natural vegetation: assessment against criteria

Natural areas are self-sustaining

To measure whether natural vegetation sites are self-sustaining , the presence / absence of regenerating seedlings of key species in each structural layer was recorded (**Table 6**). This indicator was included in the monitoring program for the first time in 2016 in line with the updated ROMP closure criteria; hence, only results for 2016 and 2017 are presented.

Table 6: Presence of regenerating seedling targets and site performance

Site no.	Offset Area	Performance criteria	2016			2017		
			Canopy	Midstorey	Ground	Canopy	Midstorey	Ground
1a	Wildlife Refuge	Presence/ absence of regenerating seedlings of key species in each structural layer (Y/N)	Y	Y	Y	Y	Y	Y
1b			Y	Y	Y	Y	Y	Y
1c	Northern offset		Y	Y	Y	Y	Y	Y
2a	Wildlife Refuge		Y	N/A	Y	Y	N/A	Y
3a	Wildlife Refuge		Y	Y	Y	Y	N	N
3b			Y	Y	Y	Y	Y	Y
3c	Northern offset		Y	Y	Y	Y	Y	Y
4a	Wildlife Refuge		Y	Y	Y	Y	Y	Y
5a	Southern offset		Y	N/A	Y	Y	N/A	Y

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Note: 'N/A' indicates that few midstorey species were present on site, and thus there was naturally an absence of seedlings of midstorey species.

Eight of the nine sites are on target for presence of regenerating seedlings of key species (**Table 6**). Site 3a had no regenerating midstorey or ground cover species despite the presence of vegetation in both structural layers. Sites 2a and 5a have no regenerating midstorey species, however midstorey vegetation was not present at both sites and therefore seedlings would not naturally be occurring, however, intervention of planting species of this strata could assist.

Area should be free of listed priority weeds and weeds of national significance

All sites monitored meet the target of <5% cover for listed priority weeds and WONS, as shown in **Table 7.** Site 3 recorded the highest cover of significant weeds, however, not at a high enough cover % to reach a level where management intervention is required.

This indicator was included in the monitoring program for the first time in 2016 in line with the updated ROMP completion criteria; hence, only results for 2016 and 2017 are presented.

Table 7: Significant weed cover targets and site performance

Site no.	Offset Area	Performance criteria (%)	2016	2017
1a	Wildlife Refuge	<5	2	2
1b			0	0
1c	Northern offset		1	0
2a	Wildlife Refuge		2	3
3a	Wildlife Refuge		1	0
3b			2	0
3c	Northern offset		1	0
4a	Wildlife Refuge		0	2
5a	Southern offset		5	2

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

The significant and other environmental weeds recorded in the natural vegetation sites are shown in **Table 8**. Five significant weeds are present in natural vegetation sites. This number is two and a half times higher than last year, however this is due to the addition of a number of species in the state significant weeds listing under the new *Biosecurity Regulation 2017* of the *Biosecurity Act 2015,* which repealed the *Noxious Weeds Act 1993*. *Eragrostic curvula* (Weeping Lovegrass) was recorded at sites 1b, 2a and 4a, at a low cover. *Hyparrhenia hirta* (Coolatai) was found only at site 4a. *Opuntia humifusa* (Eastern Prickly Pear) was present at all sites other than 2a and 5a, with a higher than average cover at site 1b. *Opuntia stricta* (Common Prickly Pear) was found at five sites including 1a, 1b, 3a, 3b and 5a. *Senecio madagascariensis* (Fireweed) is present in low abundance at all sites across the natural vegetation sites. Under the *Biosecurity Act 2015*, *S. madagascariensis* is listed as a State Priority Weed – Asset Protection and *H. hirta* is listed as a Regional Priority Weed – Asset Protection. Both of these species are under a Mandatory Measure and must be managed by minimising the spread to protect priority assets. *E. curvula* is listed under the General Biosecurity Duty (GBD) which must be managed to prevent, eliminate or minimise any biosecurity risk it poses.

The most problematic environmental weeds in the natural vegetation areas are *H. hirta,* which was not previously recorded at any of these sites and is now establishing at site 4a, *O. humifusa* which has now spread to sites 1a, 3a and 4a, rather than only located at 1b, 1c, 3b and 3c in 2016, *O. stricta* has spread to 1b, 3b and 5a, and *S. madagascariensis* now includes all sites rather than seven of the nine sites in 2016.

Table 8: Significant and other environmental weeds at natural vegetation sites

Species	1a	1b	1c	2a	3a	3b	3c	4a	5a
Eragrostis curvula (Weeping Lovegrass)		<5%		<5%				<5%	
Hyparrhenia hirta (Coolatai)								<5%	
**Opuntia humifusa* (Eastern Prickly Pear)	<5%	5 -20%	<5%		<5%	<5%	<5%	<5%	
**Opuntia stricta* (Common Prickly Pear)	<5%	<5%			<5%	<5%			<5%
**Senecio madagascariensis* (Fireweed)	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%	<5%
Additional environmental weeds at natural vegetation sites									
Anagalis arvensis	<5%			<5%		<5%		<5%	<5%
Bidens pilosa					<5%	<5%			
Brassica spp.			<5%						
Briza minor		<5%						<5%	
Carthamus lunatus								<5%	
Chloris gayana					<5%				<5%
Cirsium vulgare				<5%					
Conyza bonariensis									
Cpnyza sumatremsis					<5%				
Cynodon dactylon	<5%			<5%		<5%			<5%
Ehrharta erecta					<5%				
Facelis retusa								<5%	
Galenia pubescens									5-20%
Hydrocotyle laxiflora					<5%				
Hypochaeris radicata				<5%	<5%	<5%	<5%	<5%	
Juncus acutus					<5%				
Juncus usitatus		<5%							
Mentha spp.	<5%								
Poa spp.									<5%
Rapistrum rugosum									
Romulea rosea				<5%				<5%	
Sid rhombifolia					<5%				<5%
Sida spinose									<5%
Solanum nigrum		<5%							
Soliva sessilis				<5%				<5%	
Stachys arvensis				<5%					
Verbena bonariensis									<5%
Verbena brasiliensis				<5%				<5%	
Verbena rigida var. rigida				<5%				<5%	

*WoNS-Weeds of National Significance

3.1.2 Woodland rehabilitation sites: assessment against criteria

Overall cover for rehab areas is similar to analogue areas

In order to assess woodland rehabilitation sites against this analogue sites, two indicators are needed: bare ground (%) compared to analogue sites and presence / absence of bare areas of >10m^2. The completion criteria target for bare ground (%) is derived from the average score for bare ground at the corresponding analogue sites. The performance criteria target is set at three times the completion criteria target. These indicators were included in the monitoring program for the first time in 2016 in line with the updated ROMP closure criteria; hence, only results for 2016 and 2017 are presented.

Five of the 10 sites are meeting the performance criteria. Sites which are not meeting the performance criteria in both 2016 and 2017 include 6a and 10b. Additional sites that have not met targets include 8b and 10d, which recorded double numbers of bare patches to last year and 10a which showed eight times the number of bare patches in 2017 to 2016.

No bare areas >10m^2 were present at any of the woodland monitoring sites; therefore, all sites meet the performance criteria for this indicator.

Table 9: Bare ground targets and site performance - woodland rehabilitation areas

Offset Area	Site No	Performance Criteria Target	Completion Criteria Target	2016	2017
Bare ground (%)					
Southern Offset	6a	9	3	18	18
	7a			8	6
	7b			10	8
	8a			0	4
	8b			6	16
	9a			2	2
Great North Tip	10a	9	3	2	16
	10b			16	20
Far East Tip	10c			10	-
Great North Tip	10d			8	16
	10e			0	2
Presence of bare areas>10m² (yes/no)					
Southern Offset	6a	Ground cover is establishing evenly with no bare areas > 10 m^2	Ground cover has established evenly	N	N
	7a			N	N
	7b			N	N
	8a			N	N

	8b			N	N
	9a			N	N
Great North Tip	10a			N	N
	10b			N	N
Far East Tip	10c			N	-
Great North Tip	10d			N	N
	10e			N	N

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action.

The mix of species is similar to analogue areas and community description.

For this indicator, the species list compiled for each site was compared with a list of planted species appropriate to the target vegetation community of each site (provided by Drayton Coal Mine; see **Appendix E)**, and the percent of species on site representing target planted species was calculated. This indicator was included in the monitoring program for the first time in 2016 in line with the updated ROMP closure criteria; hence, only results for 2016 and 2017 are presented.

The performance criteria target for this indicator has been set at 50% of the completion criteria target. **Table 10** shows only site 9a meets the completion criteria target, with sites 7b and 8a only slightly below target. All remaining sites were underperforming, however most showed an increase in performance since the previous year. As mentioned last year, the proportion of listed target species is low, however the native species diversity is reasonable.

Table 10: Target species (%) targets and site performance - woodland rehabilitation sites

Offset Area	Site No.	Performance Criteria Target (%)	Completion Criteria Target (%)	2016 (%)	2017 (%)
Southern offset	6a	40	80	44	57
	7a			30	36
	7b			36	60
	8a			40	77
	8b			60	26
	9a			57	88
Great North Tip	10a			33	47
	10b			29	40
Far East Tip	10c			44	-
Great North Tip	10d			50	33
	10e			78	44

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action.

Community structure (tree, shrub, understory) approximates reference woodland sites

To assess the performance of the woodland rehabilitation sites against this criteria, the number of native species per site and the vegetation cover in each structural layer was compared with performance and completion criteria targets. The completion criteria target for each indicator is the average score at the woodland reference sites (1a to 5a, excluding DNG sites 2a and 4a) across all years for each different vegetation type. At woodland rehabilitation sites for which there is no particular target vegetation type specified, the completion criteria target given is based on the vegetation community with the lowest average score.

Table 11: Native species diversity targets and site performance - woodland rehabilitation sites

Offset Area	Site No.	Performance Criteria Target	Completion Criteria Target	2013	2014	2015	2016	2017
Southern offset	6a	10	30	13	5	10	16	11
	7a			8	6	7	10	5
	7b			5	3	6	14	15
	8a	9	27	7	4	5	5	9
	8b			2	1	3	5	3
	9a			6	8	5	7	4
Great North Tip	10a	9	27	6	13	8	9	9
	10b			9	15	11	14	14
	10c	9	27	17	17	16	18	-
	10d	9	27	-	9	5	16	10
	10e			-	-	9	9	8

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Table 11 presents the results for native flora species diversity at each of the woodland rehabilitation monitoring sites and compares this against the performance and completion criteria targets. In this case, the performance criteria target is set at 30% of the completion criteria target.

Most of the woodland rehabilitation monitoring sites are meeting the performance criteria for native species diversity, however none of the sites have met their completion criteria targets. There has been an increase in the native species diversity for sites 7b and 8a since last year's monitoring event and overall, sites that have increased in species diversity since the commencement of monitoring in 2013 include 7b, 8a, 8b, 10a, 10b, 10d and 10e. All sites should continue to be monitored with intervention such as planting, soil amelioration and weed management.

Table 12 below compares the results of the biometric vegetation cover measurements (canopy, shrub, grass and other groundcover) at each monitoring site against the relevant performance and completion criteria targets. For community structure indicators, the performance criteria target is 15% of the completion criteria, rounded to the nearest integer.

Table 12: Vegetation structure targets and site performance - woodland rehabilitation sites

Offset Area	Site No	Performance Criteria Target (%)	Completion Criteria Target (%)	2013	2014	2015	2016	2017
Canopy cover								
Southern offset	6a	4	26	0	0	0	0	0
	7a			0	0	0	0	0
	7b			0	0	0	0	0
	8a	4	25	12	0	0	0	0
	8b			0	0	0	0	0
	9a			0	0.5	0	0	6
Great North Tip	10a	4	25	8.75	1.5	1.5	19	21.5
	10b			3	5	6	9	9
Far East Tip	10c			2.5	12	16.5	18	-
Great North Tip	10d			-	10	5	18	23
	10e			-	-	0	0	26
Shrub cover								
Southern offset	6a	1	6	0	0	0	0	2
	7a			0	0	0	0	0
	7b			0	0	0	0	10
	8a	1	2	0	0	0	0	0
	8b			0	0	0	0	0
	9a			0	0	0	0	0
Great North Tip	10a	1	2	0	0	4	50	0
	10b			4	0	14	34	8
Far East Tip	10c	0	0	0	0	0	0	-
Great North Tip	10d	1	2	-	4	0	28	0
	10e			-	-	4	18	4

Offset Area	Site No	Performance Criteria Target (%)	Completion Criteria Target (%)	2013	2014	2015	2016	2017
Native grass cover								
Southern offset	6a	5	33	44	0	34	47	0
	7a			32	6	8	5	0
	7b			58	4	10	36	6
	8a	5	34	0	0	12	10	0
	8b			0	0	0	0	0
	9a			0	0	2	5	0
Great North Tip	10a	5	33	0	0	2	5	0
	10b			26	20	26	10	0
	10c	3	17	8	38	22	5	-
	10d	5	33	-	12	14	29	2
	10e			-	-	92	20	0
Native groundcover								
Southern offset	6a	2	13	4	0	4	6	2
	7a			0	4	2	0	0
	7b			4	0	0	8	0
	8a	6	36	2	0	4	0	4
	8b			0	0	0	0	0
	9a			0	0	0	0	0
Great North Tip	10a	2	13	10	10	10	20	0
	10b			0	0	2	0	0
Far East Tip	10c	1	8	4	6	8	0	-
Great North Tip	10d	2	13	-	2	0	6	0
	10e			-	-	2	2	0

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Sites 10a, 10d and 10e are meeting performance and completion criteria for canopy cover, or very near to and all covers for these sites as well as 9a are higher than canopy cover in 2016. The entire Southern Offset area is underperforming for canopy cover as is 10b within the Great North Tip, though 10b canopy cover has continuously increased across all monitoring years since 2013. Large areas within the Southern Offset were subject to ongoing clearing, capping and re-seeding works throughout 2015-2016 as part of rehabilitation of areas affected by spontaneous combustion, which may explain the canopy cover results from the sites in this monitoring area.

Low shrub cover is relatively normal in the vegetation community for most of the Southern Offset, according to shrub cover benchmarks, therefore it is not surprising to show low cover in these areas (OEH 2016). Even so, only site 7b has met the completion criteria for shrub cover in this area, with the inclusion of 10b and 10e from the Great North Tip. There is also a large drop in cover for the whole Great North Tip area, though this may be due to a very dry year across the Hunter and most of New South Wales.

Concerning native grass cover, this year presents a complete contrast to last year, with no sites meeting the completion criteria for this area. Extensive direct seeding works took place during 2015-2016 in the Southern Offset area and it was presumed native grass cover would improve following this. This has not happened and therefore targeted intervention will be required such as spraying out the dominant exotic groundcover and seeding these areas with native species.

All sites in the Southern Offset Area and the Great North Tip have not met the completion criteria. Sites 6a and 8a were the only sites across this area with a record of native ground cover. Fluctuations in herbs and forbs are expected given high seasonal and climatic variation between years, particularly 2017 as this year showed extremely low rainfall. Continued monitoring is recommended for all of these sites. Intervention works (extensive direct seeding and planting) were ongoing during 2015-2016 in the Southern Offset area, however this has not been successful and will need additional weed management and repeated seeding to assist native ground covers.

Weeds should be actively managed until desired vegetation is established.

Table 13 provides the results of the exotic species cover of the woodland rehabilitation monitoring sites and compares this against the performance and completion criteria targets. Note that the performance criteria is based on total weed cover for sites 0-5 years old, whilst the completion criteria is based on significant weed cover for sites more than 5 years old. Thus the performance target only relates to rehab sites that are less than 5 years old (sites 6a–9a, 10e), whilst the completion criteria relate to those established >5 years ago (10a-10d). Significant weeds weed cover is a new indicator which began in the 2016 monitoring program to reflect the updated ROMP criteria, and thus no data is provided for 2013-2015.

Of the sites greater than 5 years old, 10a, 10b and 10d, are all on target for the completion criteria. Site 10a, however, should be monitored to ensure the spread of *H. hirta* does not continue rising as it has from 2016 to 2017.

All of the sites less than 5 years old (6a, 7a, 7b, 8a, 8b, 9a and 10e) are still underperforming for the criterion of <20% total weed cover, with weed cover at most of the sites having increased again since 2016. These sites have weed covers that vary between 52 - 92% weed cover, and all require intervention to bring them in line with the ROMP performance criterion. Intervention in early stages of rehabilitation will help to reduce weed competition with the newly established native plantings.

Table 13: Exotic species cover targets and site performance - woodland rehabilitation sites

Biometric Type	Offset Area	Site No.	Performance Criteria Target (%)	Completion Criteria Target (%)	2013 (%)	2014 (%)	2015 (%)	2016 (%)	2017 (%)
Weed cover (%)									
Southern offset		6a	<20	-	54	2	22	29	68
		7a			80	90	74	85	52
		7b			72	0	30	44	76
		8a			18	4	62	88	92
		8b			88	86	84	92	62
		9a			93.5	90	90	77	92
Great North Tip		10e	<20	-	-	-	42	78	78
Signifiant weed cover (%)									
Great North Tip		10a	-	<5	-	-	-	2	3
		10b			-	-	-	2	2
Far east tip		10c			-	-	-	5	-
Great North Tip		10d			-	-	-	2	0

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Table 14 provides a summary of the significant and environmental weeds at each monitoring site, as well as observed changes in weed abundance between 2016 and 2017. A full list of all species (including weeds) per monitoring site is provided in **Appendix A**.

Of the recorded significant weeds, *Galenia pubescens* (Galenia) is present at sites 8a, 8b and 9a. This species should be monitored at both sites 8a and 8b due to their covers reaching just below a quarter of the site. *H. hirta* was recorded within a range of low to high abundance at sites 6a, 7a, 7b, 9a, 10a and 10d, with intervention needed at site 9a. *O. stricta* is present in low abundance at sites 7a, 9a and 10b, which represents the same observations as 2016. *S. madagascariensis* is present in low abundance at all woodland rehabilitation sites except 8b, 9a and 10d, three sites less than 2016. Under the *Biosecurity Act 2015 S. madagascariensis* is listed as a State Priority Weed – Asset Protection and *H. hirta* is listed as a Regional Priority Weed – Asset Protection. Both of these species are under a Mandatory Measure and must be managed by minimising the spread to protect priority assets. *S. madagascariensis and Opuntia* sp. are both declared as WONS and all landowners and managers are responsible for managing these species according to each state or territories Government legislations and regulations.

Many of the woodland rehabilitation sites also showed high cover scores of environmental weeds, especially *A. arvensis* (Scarlet Pimpernel), *Chloris. gayana* (Rhodes Grass), *Cynodon dactylon* (Couch), *Pennisetum clandestinum* (Kikuyu) and *Plantago lanceolate* (Plantain). This is not desirable for rehabilitation towards a functional woodland community, although these species are at least providing soil cover and stabilisation. A strategy is required to gradually reduce exotic cover and increase native ground cover within the areas to be restored to native woodland. Effective methods could include slashing exotics prior to flowering / seed set, weed spraying, and creating strips of native ground cover by stripping weeds and seeding with native species. These native ground cover strips or patches could provide a seed source to facilitate colonisation of the rehabilitation areas.

Table 14: Significant and other environmental weeds at woodland rehabilitation sites

Species	6a	7a	7b	8a	8b	9a	10a	10b	10d	10e
Galenia pubescens (Rhodes Grass)				5-20%	5-20%	<5%				
Hyparrhenia hirta (Coolatai)	5-20%	<5%	<5%			50-75%	5-20%		<5%	
**Opuntia stricta* (Common Prickly Pear)		<5%				<5%		<5%		
**Senecio madagascariensis* (Fireweed)	<5%	<5%	<5%	<5%			<5%	<5%		<5%
Additional environmental weeds at woodland rehab sites										
Anagalis arvensis	<5%	5-20%	<5%	<5%	<5%	<5%	<5%	<5%		<5%
Asphodelus fistulosus			<5%				<5%			
Aster subulatus							<5%			
Bidens pilosa	<5%	<5%					<5%			<5%
Brassica spp.		<5%								
Chloris gayana		5-20%	<5%	5-20%		<5%	<5%	<5%	5-20%	<5%
Chloris truncata			<5%							
Cirsium vulgare				<5%		<5%				
Conyza bonariensis				<5%						<5%
Cpnyza sumatremsis	<5%			<5%		<5%	<5%			<5%
Cynodon dactylon	<5%		<5%	5-20%		5-20%		5-20%	<5%	5-20%
Geranium solanderi										<5%
Gomphocarpus fruticosus				<5%		5-20%	<5%			<5%
Medicago polymorpha		<5%	<5%				<5%			
Medicago sativa	<5%	<5%	<5%	<5%		<5%		<5%	<5%	<5%
Melinis repens	5-20%		<5%		<5%		5-20%	<5%	5-20%	<5%
Modiola caroliniana				<5%						
Panicum coloratum	<5%	5-20%	<5%			<5%	<5%			
Panicum spp.				5-20%	50-75%					
Paspalum dilatatum	<5%									
Paspalum spp.						<5%				
Paspalum urvellei							<5%			
Pennisetum clandestinum	<5%			20-50%		<5%				<5%
Plantago lanceolata		<5%	<5%	<5%		5-20%	<5%	<5%	<5%	
Rapistrum rugosum				<5%						<5%
Setaria parviflora				<5%						
Setaria sphacelata							<5%		<5%	
Sid rhombifolia	<5%		<5%	<5%		<5%			<5%	<5%
Sida spp.			<5%							
Solanum americanum					<5%					
Sonchus oleraceus	<5%	<5%						<5%		<5%
Tagetes minuta			<5%							
Trifolium repens						<5%				
Verbena bonariensis						<5%				
Verbena brasiliensis				<5%						<5%

Species	6a	7a	7b	8a	8b	9a	10a	10b	10d	10e
Vicia spp.						<5%				
Xanthium occidentale					<5%					

*WoNS-Weeds of National Significance

Community is self-sustaining

This indicator is measured by the presence of seedlings of target species in each structural layer. This indicator was included in the monitoring program for the first time in 2016 in line with the updated ROMP closure criteria; hence, data is only given for 2016 and 2017.

All sites had seedlings for key canopy species except sites 9a. Key midstorey species were less common across the sites and recorded only at sites 6a, 7b, 8a and 10e. No sites had seedlings of target ground layer species. It is likely that the very high levels of exotic groundcover are hindering the germination and growth of native seedlings at many of the woodland rehabilitation sites especially site 9a. Weed control (see section above) is likely to facilitate more successful regeneration, by reducing competition from exotic species.

Table 15: Presence of regenerating seedlings targets and site performance – woodland rehabilitation sites

Offset Area	Site No.	Performance Criteria Target	Completion Criteria Target	2016			2017		
				Canopy	Midstorey	Ground	Canopy	Midstroey	Ground
Southern offset	6a	Seeded species are emerging and surviving.	Evidence of self-seeded seedlings of target species in all structural layers (Y/N)	Y	Y	N	Y	Y	N
	7a			Y	N	N	Y	N	N
	7b			Y	Y	N	Y	Y	N
Southern offset	8a			Y	Y	N	Y	Y	N
	8b			Y	Y	N	Y	N	N
	9a			N	N	N	N	N	N
Great North Tip	10a			Y	N	N	Y	N	N
	10b			Y	N	N	Y	N	N
Far east tip	10c			N	N	N	-	-	-
Great North Tip	10d			Y	N	N	Y	N	N
	10e			Y	N	N	Y	Y	N

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Successful tube stock planting

The success of tubestock planting was measured by estimating the percentage of planting losses within each site, based on the proportion of tubestock protectors that were empty (**Table 16**). This indicator was only applicable to those sites that had been rehabilitated using tubestock (6a to 9a), not those which had been direct-seeded (sites 10a-10e). This indicator was included in the monitoring program for the first time in 2016 in line with the updated ROMP closure criteria; hence, data is only given for 2016 and 2017.

An appraisal of tubestock losses was completed in June 2017 and was presented to DP&E. Planting out of tubestock has been discontinued in favour of direct seeding.

Table 16: Tubestock loss targets and site performance - woodland rehabilitation sites

Offset Area	Site No.	Performance Criteria Target	Completion Criteria Target	2016 (%)	2017 (%)
Southern offset	6a	<10% of total plantings in any one planting area.	No further tube stock required.	50	Unknown
	7a			75	Unknown
	7b			75	Unknown
Southern offset	8a			98	Unknown
	8b			95	Unknown
	9a			Unknown	Unknown
Great North Tip	10a			N/A	
	10b			N/A	
Far east tip	10c			N/A	-
Great North Tip	10d			N/A	
	10e			N/A	

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Note: 'N/A' indicates site has been direct seeded rather than planted with tubestock, and therefore this measure is not relevant. 'Unknown' indicates that the site is too long-established to be able to accurately estimate tubestock losses.

3.1.3 Pasture rehabilitation sites: assessment against criteria

Effective cover of pasture species

For pasture rehabilitation sites, the criteria is to achieve cover of palatable pasture species for an end use of grazing. The indicator for target pasture species cover is shown in **Table 17**, along with the performance and completion criteria derived from the ROMP. This indicator was included in the monitoring program for the first time in 2016 in line with the updated ROMP closure criteria; hence, data is shown for only 2016 and 2017. Target pasture species are shown in **Appendix F**.

In reference to the completion criteria target of 90%, two of the sites are meeting this figure, sites 11b and 11c. All other sites are relatively close in cover except site 11f which is significantly underperforming at only 30%. Low pasture species cover across this site is likely due to the very high exotic species cover present and weed species are likely outcompeting target pasture species. The score is expected to improve if targeted weed control is undertaken.

It should be noted also, that species relating to 'target pasture species' have been taken from the Table 3 Section 4.11.3 of the ROMP on page 30 and include *C. dactylon*, *P. clandestinum* and *Phalaris aquatica* (Phalaris). Additional pasture species have been included in cover scores that are listed in **Appendix F**.

Table 17: Pasture cover targets and site performance – pasture rehabilitation sites

Offset Area	Site No.	Performance Criteria Target (%)	Completion Criteria Target (%)	2016 (%)	2017 (%)
Great North Tip	11a	70	90	80	65
	11b			44	95
	11c			80	90
	11d			50	87.5
Far east tip	11e			34	-
South Tip	11f			48	30
Geofluv	11g			94	75
Far east tip	11h			92	87.5
	11i			78	82.5

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

The mix of species in the area supports successful grazing practices

For this indicator, the measure was the proportion of target species present on site as a percentage of all species present (**Table 18**). Target pasture species are shown in **Appendix F**. For this indicator, the performance criteria target was set at 50% of the longer term completion criteria target. This indicator was included in the monitoring program for the first time in 2016 in line with the updated ROMP closure criteria; hence, data is shown for only 2016 and 2017.

No sites meet the completion criteria for this target. The current species composition of the pasture rehabilitation sites therefore is not ideal for successful grazing, and intervention would be required at all sites in order to achieve the nominated targets. Intervention could involve spraying out strips of existing pasture and seeding these areas with target species, in order to introduce more palatable pasture species.

Table 18: Target species as a proportion of all species targets and site performance – pasture rehabilitation sites

Offset Area	Site No.	Performance Criteria Target (%)	Completion Criteria Target (%)	2016 (%)	2017 (%)
Great North Tip	11a	40	80	28	30
	11b			26	28
	11c			13	35
	11d			38	28
Far east tip	11e			24	-
South Tip	11f			38	24
Geofluv	11g			53	33
Far east tip	11h			32	15
	11i			14	11

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Pasture is not dominated by one species.

This indicator involved recording the percentage cover of the several most dominant pasture species present on each site (**Table 19**). This indicator was included in the monitoring program for the first time in 2016 in line with the updated ROMP closure criteria; hence, data is shown for only 2016 and 2017.

Three out of the eight monitored sites met the completion target ranging from 20-40% at sites 11b, 11f and 11g. Sites 11a and 11d were shown to be underperforming by 10% with one species, *C. gayana*, representing 50% of the total cover. For site 11c, 11h and 11i, *P. clandestinum* comprised 75 - 80% cover on site. These sites are considered to require intervention in order to meet targets. This could include spraying out strips of the site where *P. clandestinum* is dominant, followed by seeding with a range of other pasture species to increase diversity.

Table 19: Percent cover of dominant species targets and site performance – pasture rehabilitation sites

Offset Area	Site No.	Performance Criteria Target (%)	Completion Criteria Target (%)	2016 (%)	2017 (%)
Great North Tip	11a	No single species has a significantly higher abundance	No species are >40% of cover	40	50
	11b			50	40
	11c			80	80
	11d			35	50
Far east tip	11e			30	-
South Tip	11f			15	25
Geofluv	11g			50	20
Far east tip	11h			40	75
	11i			40	80

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Diversity of perennial species

Table 20 shows the diversity of perennial species per square metre at each of the pasture rehabilitation sites and compares these to the performance and completion criteria specified in the ROMP. Note the number of perennial species is a new indicator that started in the 2016 monitoring program; therefore, data is shown for only 2016 and 2017.

None of the sites are currently meeting completion targets with regard to diversity of perennial species, however most of the sites have increased in perennial species per square metre except for sites 11a, 11g and 11h. Further direct seeding may be required in order to increase the diversity of suitable perennial pasture species. Examples of suitable perennial pasture species with high forage value include *Medicago sativa* (Lucerne), *Trifolium repens* (White Clover), *Dactylis glomerata* (Cocksfoot), *Lolium perenne* (Perennial Ryegrass) and *Paspalum dilatatum* (Paspalum). See **Appendix F** for a comprehensive list of suitable pasture species. As the sites all exhibit high levels of groundcover, it may be necessary to first spray out strips of grass in order to create space for seeding.

Table 20: No. perennial species per square metre targets and site performance – pasture rehabilitation sites

Offset Area	Site No.	Performance Criteria Target (%)	Completion Criteria Target (%)	2016 (%)	2017 (%)
Great North Tip	11a	5	7	2.25	1.75
	11b			1.75	3.5
	11c			1	2
	11d			2.5	3
Far east tip	11e			2	-
South Tip	11f			2	3.5
Geofluv	11g			2.75	2.25
Far east tip	11h			1.75	1.25
	11i			2	3.25

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Weeds should be actively managed until desired vegetation is established and maintained.

Significant weed cover is the focus for pasture rehabilitation sites, rather than total cover of exotic species, due to the intentional seeding of exotic pasture species at these sites. **Table 21** shows the-significant weed cover at each of the pasture rehabilitation sites, and compares these scores to the performance and completion criteria targets given in the ROMP.

All monitoring sites are meeting completion criteria targets. Significant weeds in order from most common to least common across the eight sites include *S. madagascariensis*, *G. pubescens* (Galenia) and *Xanthium occidentale* (Noogoora Burr).

Table 21: Significant weed cover targets and site performance – pasture rehabilitation sites

Offset Area	Site No.	Performance Criteria Target (%)	Completion Criteria Target (%)	2016 (%)	2017 (%)
Great North Tip	11a	20	5	2	5
	11b			2	2.5
	11c			1	5
	11d			2	5
Far east tip	11e			50	-
South Tip	11f			40	5
Geofluv	11g			2	2.5
Far east tip	11h			5	2.5
	11i			0	5

Green = site achieving performance indicator and no intervention required; **Amber** = monitor and no intervention required; **Red** = site underperforming and requiring action

Table 22: Significant weeds, WONS and other environmental weeds recorded – pasture rehabilitation sites (excludes intentionally seeded pasture species)

Species	11a	11b	11c	11d	11f	11g	11h	11i
Galenia pubescens (Rhodes Grass)	<5%		<5%		<5%	<5%		
Hyparrhenia hirta (Coolatai)				<5%	<5%			
**Senecio madagascariensis* (Fireweed)	<5%	<5%	<5%	<5%			<5%	<5%
Xanthium occidentale (Noogoora Burr)								
Additional environmental weeds at woodland rehab sites								
Anagalis arvensis	<5%	<5%	<5%	<5%		<5%	<5%	<5%
Asphodelus fistulosus						<5%	<5%	<5%
Bidens pilosa	<5%	<5%	<5%		<5%	<5%	<5%	
Chloris gayana	20-50%	<5%	<5%	20-50%	<5%	<5%		
Cirsium vulgare	<5%		<5%	<5%				<5%
Cpnyza sumatremsis	<5%	<5%	<5%	<5%			<5%	
Cynodon dactylon	<5%	<5%		5-20%	<5%	5-20%		
Geranium solanderi				<5%				<5%
Gomphocarpus fruticosus	<5%	<5%		<5%	<5%		<5%	<5%
Medicago polymorpha	<5%	5-20%	<5%	<5%	<5%	<5%		
Medicago sativa	<5%	<5%	<5%	<5%		<5%		
Panicum coloratum			<5%	<5%		20-50%		
Paspalum spp.				<5%				
Pennisetum clandestinum		2-50%	80%		<5%	<5%	50-75%	>75%
Phalaris aquatica		5-20%	<5%	<5%	<5%	<5%	<5%	
Plantago lanceolata	5-20%	5-20%	<5%	5-20%	20-50%	<5%	<5%	<5%
Rapistrum rugosum		<5%	<5%			<5%	<5%	<5%
Sonchus asper		<5%	<5%	<5%		<5%	<5%	
Sonchus oleraceus	<5%				<5%			
Stachys arvensis				<5%	<5%		<5%	<5%

Species	11a	11b	11c	11d	11f	11g	11h	11i
Tagetes minuta		<5%	<5%			<5%		
Trifolium arvense				<5%				
Trifolium campestre	<5%							
Trifolium glomeratum		<5%						
Verbena bonariensis		<5%		<5%				<5%
Verbena brasiliensis		<5%						
Vicia spp.	<5%			<5%	<5%	<5%	<5%	<5%

*WoNS-Weeds of National Significance

3.2 Fauna monitoring

3.2.1 Native fauna

Overall native species diversity

Appendix D provides the full fauna species list for the monitoring sites. A total of 72 fauna species were recorded across all seven sites, including three vertebrate pest species. This represents a decline in species diversity from 2016 (when 90 fauna species were recorded, including three vertebrate pests). Consistent with last year, site 5a in the Southern Offset was the most diverse, with 34 native species (**Figure 7**). Site 9a, also in the Southern Offset was the least diverse with 15 native species. Species richness was consistently higher at intact (analogue) sites (1a to 5a) compared with rehabilitation sites (9a and 10a).

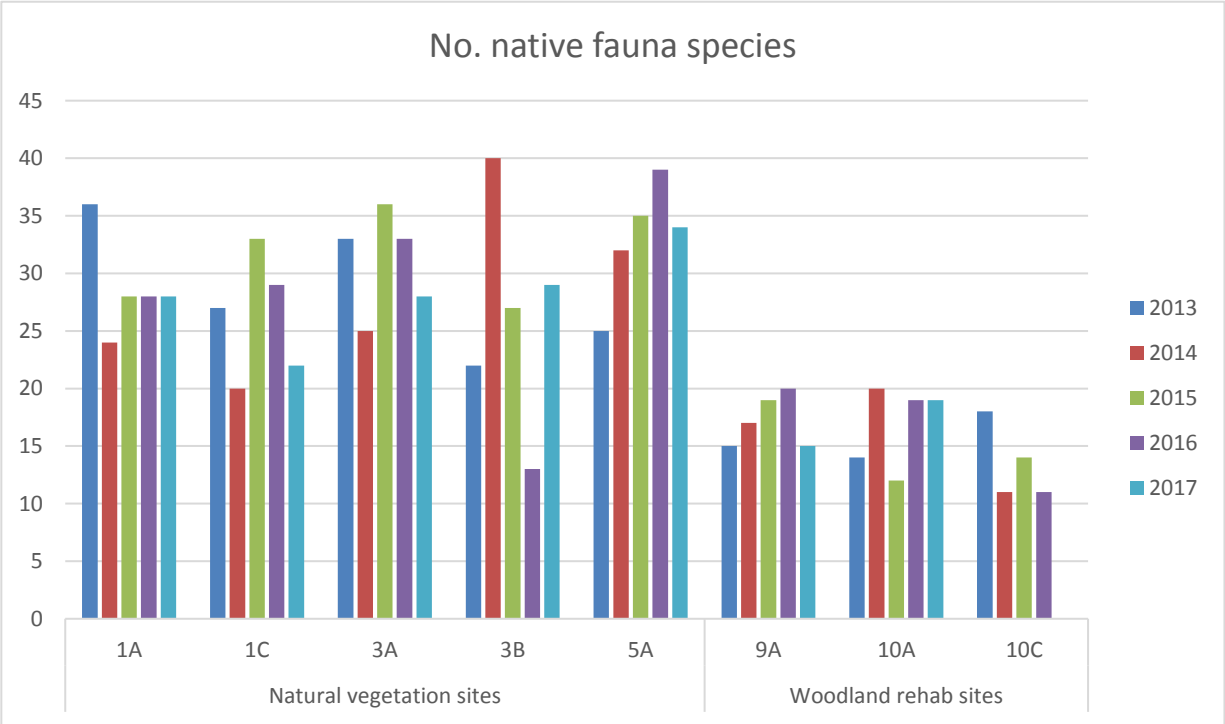

Figure 7: Number of native fauna species per monitoring site 2013-2017

Threatened species

Eight threatened fauna species and no migratory species were recorded during the 2017 monitoring. The majority of the threatened species were recorded on natural vegetation sites; however one threatened microbat species (*Miniopterus norfolkensis* (East Coast Freetail Bat)) was recorded on woodland rehabilitation sites 9a and five threatened bat species (*Chalinolobus dwyeri (*Large-eared Pied Bat)*, Miniopterus australis (*Little Bentwing Bat), Miniopterus schreibersii oceanensis (Eastern Bentwing Bat), *Mormopterus norfolkensis (*East Coast Freetail Bat*), Myotis macropus* (Southern Myotis)) were recorded at site 10a.

Table 23 shows the threatened and migratory species recorded during the past five years of the spring monitoring program. More detailed information on the threatened species recorded on site is given under the subheadings below.

Table 23: Threatened and migratory species recorded during 2013-2017 monitoring

Taxon	2013	2014	2015	2016	2017
Arboreal mammals	- *Petaurus norfolcensis* (Squirrel Glider)	*Petaurus norfolcensis* (Squirrel Glider)	*Petaurus norfolcensis* (Squirrel Glider)	*Petaurus norfolcensis* (Squirrel Glider) *Phascogale tapoatafa* (Brush-tailed Phascogale	
Terrestrial mammals	-		*Dasyurus maculatus* (Spotted-tail Quoll)	*Dasyurus maculatus* (Spotted-tail Quoll)-	-
Bats	*Falsistrellus tasmaniensis* (Eastern False Pipistrelle) *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)	*Chalinolobus dwyeri* (Large-eared Pied Bat) *Miniopterus australis* (Little Bentwing-bat) *Miniopterus schreibersii oceanensis* Eastern Bentwing-bat *Mormopterus norfolkensis* (Eastcoast Freetail Bat)	*Falsistrellus tasmaniensis* (Eastern False Pipistrelle) *Miniopterus australis* (Little Bentwing-bat) *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) *Mormopterus norfolkensi* (Eastern Freetail-bat) *Scoteanax rueppellii* (Greater Broad-nosed Bat)	*Falsistrellus tasmaniensis* (Eastern False Pipistrelle) *Miniopterus schreibersii oceanensis,* (Eastern Bentwing -bat) *Mormopterus norfolkensis* (Eastern Freetail-bat) *Scoteanax rueppellii* (Greater Broad-nosed Bat)	*Chalinolobus dwyeri* (Large-eared Pied Bat) *Miniopterus australis* (Little Bentwing Bat) *Miniopterus schreibersii oceanensis* (Eastern Bentwing Bat) *Mormopterus norfolkensis* (Eastern Free-tailed Bat) *Myotis macropus* (Southern Myotis), *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat) *Vespadelus troughtoni* (Eastern Cave Bat).
Birds	*Chthonicola sagittatus* (Speckled Warbler)	*Chthonicola sagittatus* (Speckled Warbler) *Daphoenositta chrysoptera* (Varied Sittella)	*Hirundapus caudacutus* (White-throated Needletail) *Chthonicola sagittata* (Speckled Warbler)	*Chthonicola sagittata* (Speckled Warbler) *Pomatostomus temporalis* (Grey-crowned Babbler)	*Pomatostomus temporalis* (Grey-crowned Babbler)

Taxon	2013	2014	2015	2016	2017
		Hieraaetus morphnoides (Little Eagle) *Myiagra cyanoleuca* (Satin Flycatcher)	*Glossopsitta pusilla* (Little lorikeet)		*Glossopsitta pusilla* (Little lorikeet)

Arboreal mammals

In accordance with previous years, diversity of arboreal mammals was generally low across the monitoring sites **(Figure 8**). Four species in total were recorded across all sites, with two representing the highest number found on any one site (sites 3a and 5a). *Trichosurus vulpecula* (Common Brushtail Possum) was again the most common arboreal species, identified at five out of the seven monitored sites.

No threatened arboreal mammal species were recorded in 2017, however an unidentified *Petaurus* sp. was recorded on a remote camera at site 5a.

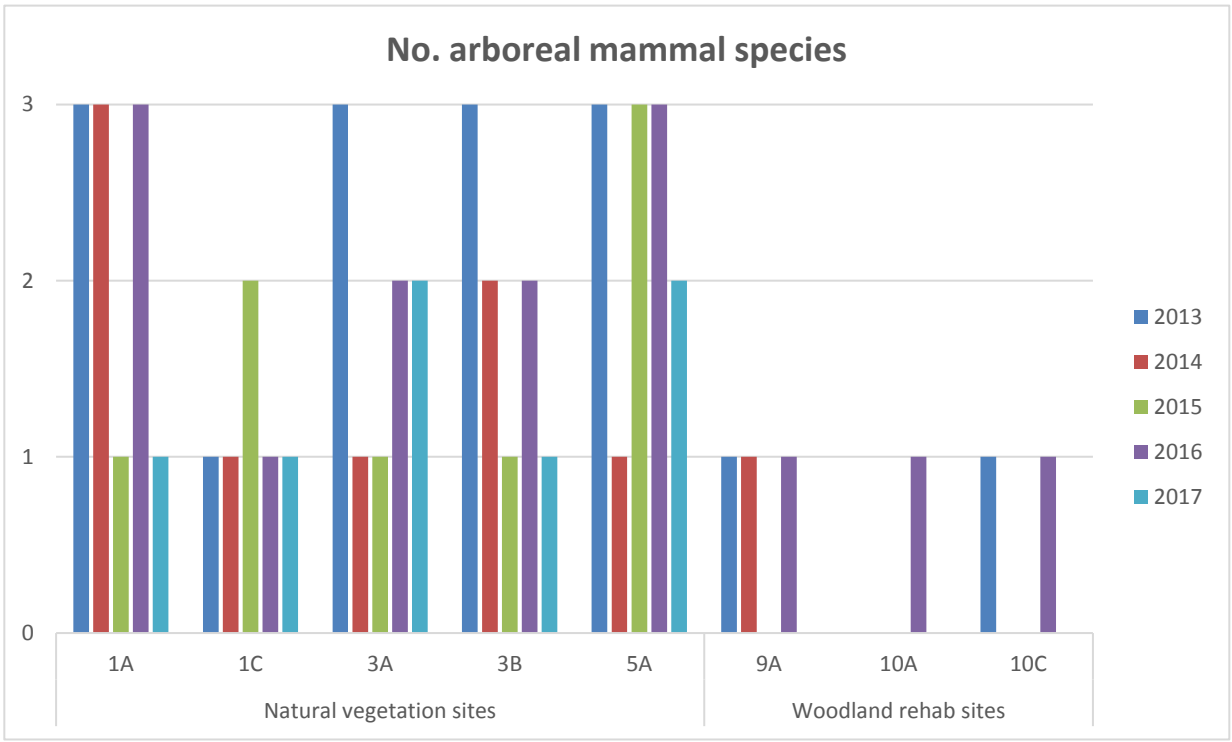

Figure 8: Arboreal mammal species diversity recorded per monitoring site 2013-2017

Terrestrial mammals

All sites recorded at least one terrestrial mammal species except 1c and 3a (**Figure 9**). Site 9c had the highest terrestrial mammal diversity, with 4 species recorded. The most common terrestrial mammals were both *Macropus giganteus* (Eastern Grey Kangaroo) and *M. rufogriseus* (Red-necked Wallaby) found across sites 1a, 3b, 5a, 9a and 10a. No new terrestrial mammal species were recorded during the 2017 monitoring.

Figure 9: Terrestrial mammal species diversity recorded per monitoring site 2013-2017

Microchiropteran Bats

Twelve (12) microchiropteran bat species were recorded during 2017 monitoring. **Figure 10** shows general microbat activity was high at sites 1a, 3b and 10a, with calls recorded more often than every two minutes each night throughout the survey period. Calls tended to be long and included many feeding buzzes indicating bats foraging within the area

Seven threatened bat species were recorded during the 2017 monitoring, inlcuidng *Chalinolobus dwyeri* (Large-eared Pied Bat), *Miniopterus australis* (Little Bentwing Bat), Eastern Bentwing Bat, *Mormopterus norfolkensis* (Eastern Free-tailed Bat), *Myotis macropus* (Southern Myotis), *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat) and potentially *Vespadelus troughtoni* (Eastern Cave Bat). This is a significant increase from the 2016 monitoring period, with an additional three species recorded. This year also marks the highest number of bat species across all monitoring periods.

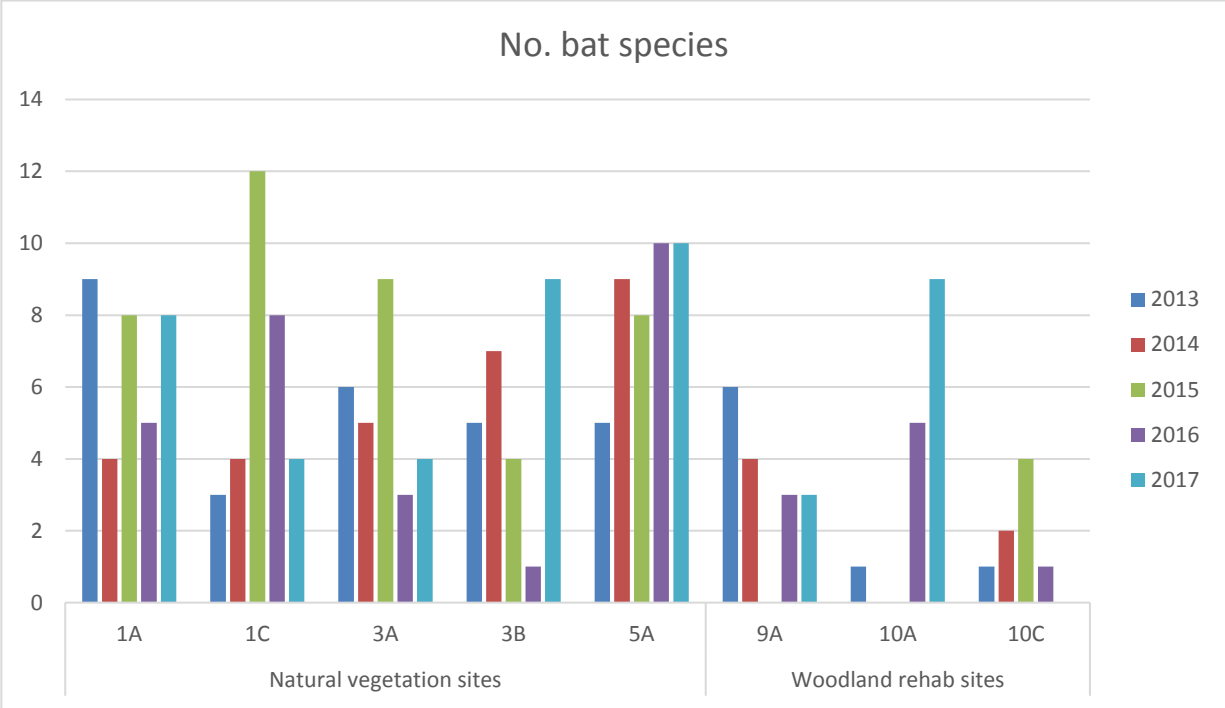

Figure 10: Bat species diversity recorded per monitoring site 2013-2017

Birds

Forty (40) bird species were recorded during 2017 monitoring. Similar to 2016, site 3a had the highest bird diversity, with 19 species present (**Figure 11**). As in 2016, sites 10a and 9a had the lowest diversity with six and eight species present, respectively. Both of these sites are found in the woodland rehabilitation areas, which represent high numbers of young tree growth. Both sites are relatively isolated and surrounded by cleared pastures. The most common bird species across the sites included *Corvus coronoides* (Australian Raven) and *Cracticus tibicen* (Australian Magpie), followed by *Malurus cyaneus* (Superb Fairy-wren) and *Streptera graculina* (Pied Currawong).

Two threatened bird species were recorded, including *Glossopsitta pusilla* (Little Lorikeet) (recorded from the song meters at site 3b) and *Pomatostomus temporalis temporalis* (Grey-crowned Babbler) (incidentally recorded at site 3a), both listed as vulnerable under the *Biodiversity Conservation Act 2016* (BC Act). 2017 is the second year The Grey-crowned Babbler has been recorded on site.

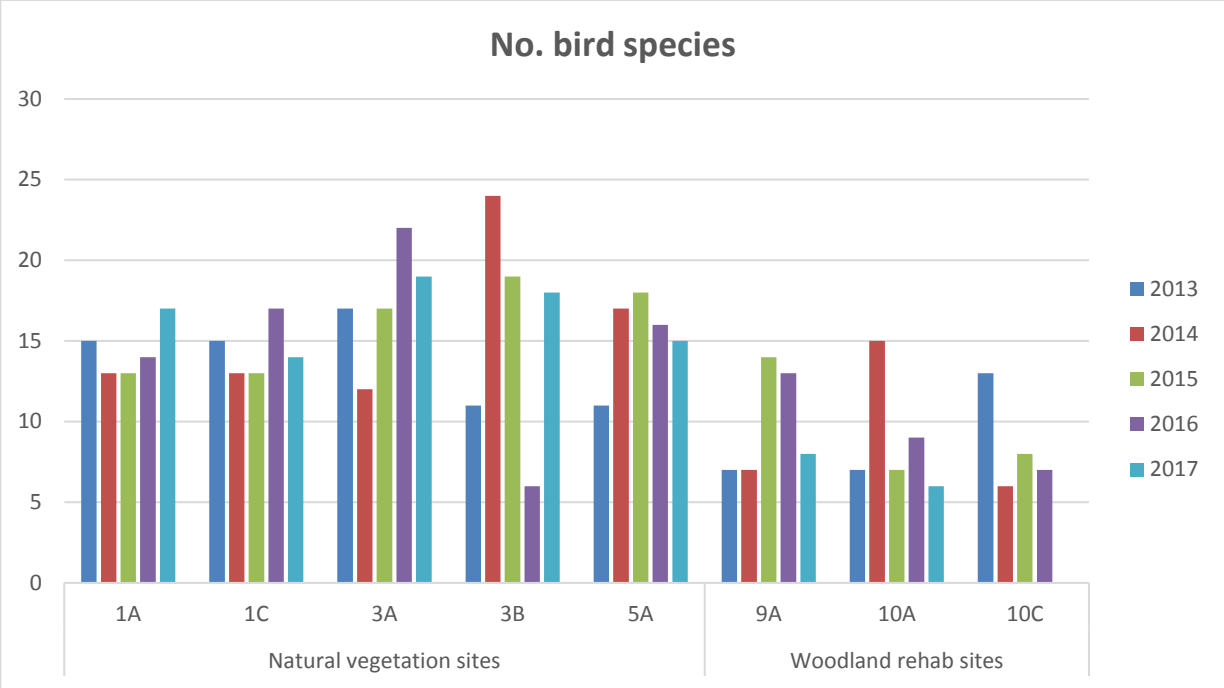

Figure 11: Bird species diversity recorded per monitoring sites 2013-2017

Reptiles

Low diversity and numbers of reptiles was observed across all sites, with a maximum number of three species occurring at 1c (**Figure 12**). Species were observed at all sites except 1a and 9a, with single observations recorded at sites 5a and 10a.

Consistent with the results from the 2013–2016 monitoring periods, the most commonly recorded species were skinks (Scincidae).

Figure 12: Reptile species diversity recorded per monitoring site 2013-2017

Amphibians

Amphibian species were only observed at site 3a during 2017. Diversity and presence was likely driven by the presence of several dams in close proximity to the site, however, low diversity and presence was likely due to very low rainfall across the region and state this year (**Figure 13**).

Both species of amphibian was observed twice each and includes *Crinia signifera* (Clicking Froglet) and *Litoria vereauxii* (Whistling Tree Frog). The Whistling Tree Frog is a new species recorded amphibian species for the monitoring program.

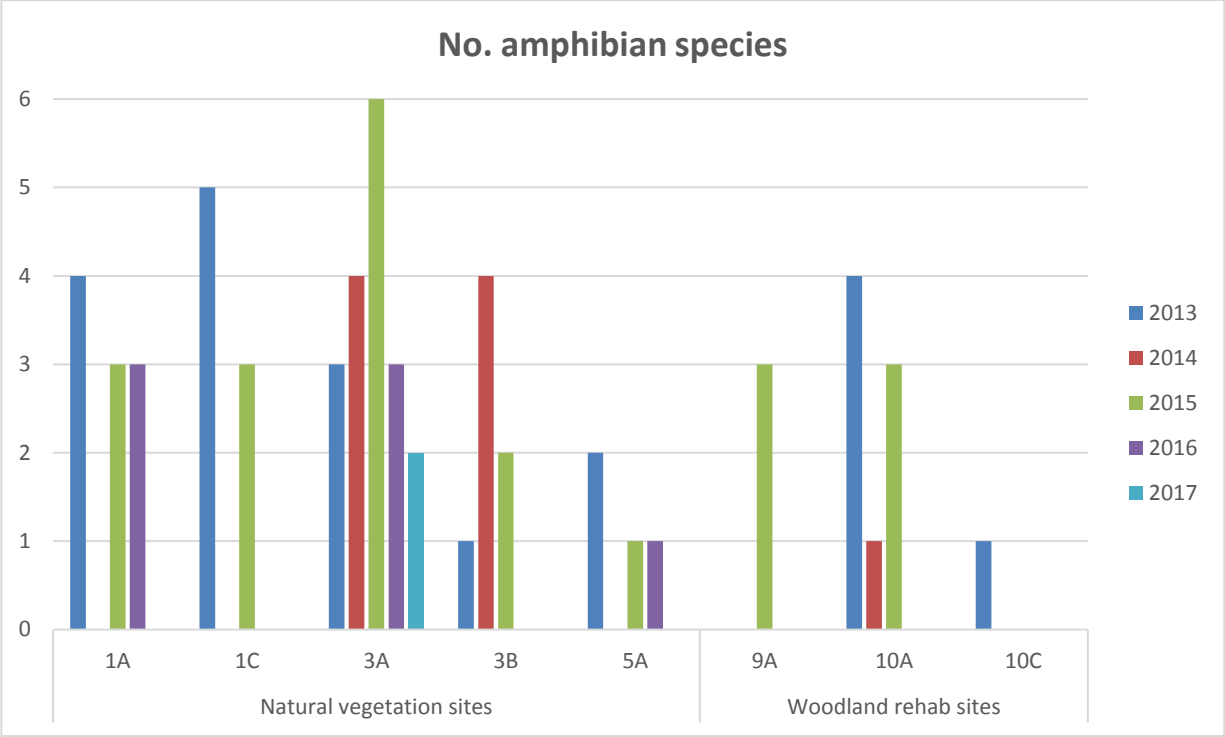

Figure 13: Amphibian species diversity recorded per monitoring site 2013-2017

3.2.2 Vertebrate pest species

No new vertebrate pest species were recorded during surveys in 2017 (**Figure 14**). Foxes were the most common pest species recorded during 2017, although only three individuals were recorded across all sites. Additional species include one individual of *Canis lupis familiaris* (Wild Dog) and one individual of *Lepus europaeus* (European Hare). Only sites 1a, 5a and 10a experienced pest activity this survey period. Only five individuals in total were observed during 2017, compared to twelve during 2016 monitoring

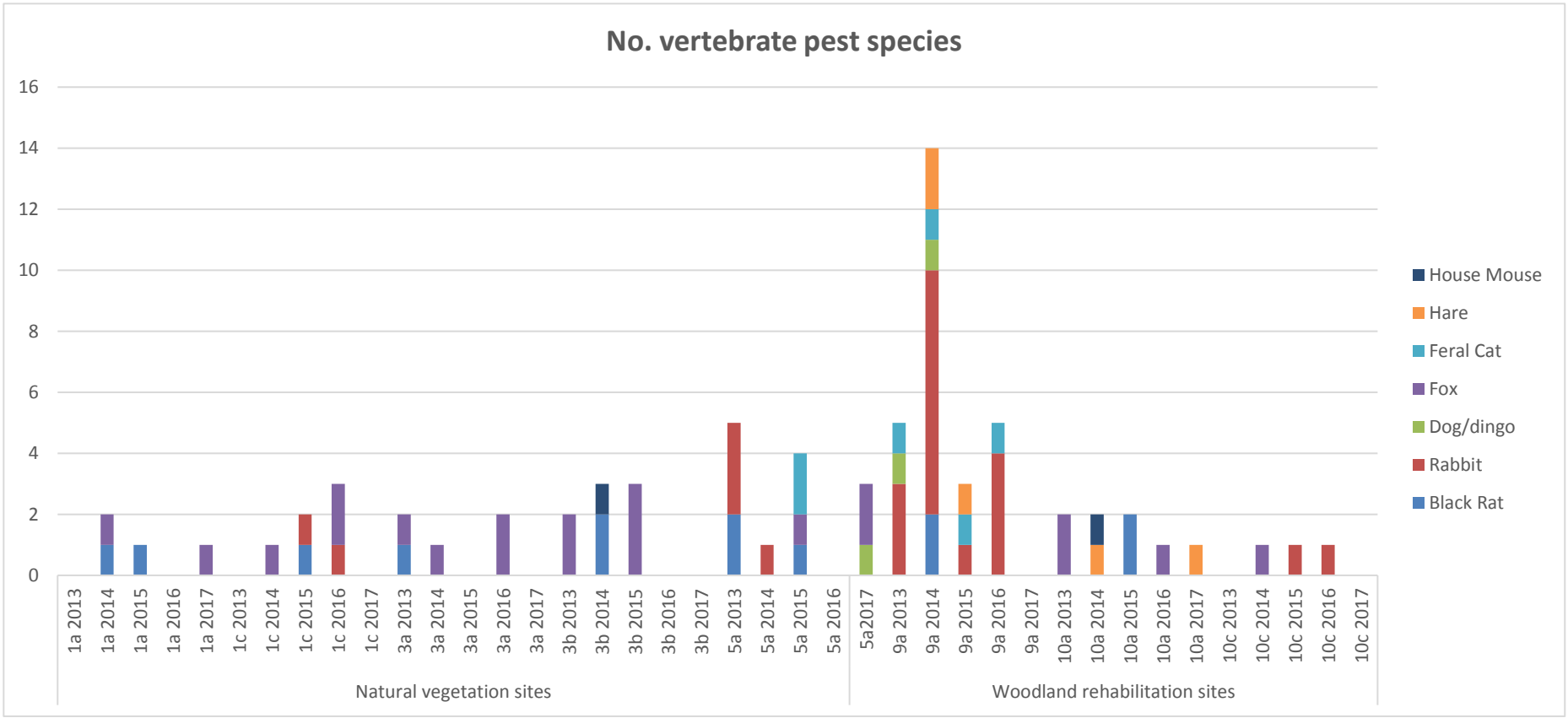

Figure 14: Comparison of the abundance of vertebrate pest species per monitoring site 2013-2017

3.2.3 Natural vegetation sites: assessment against performance / completion criteria

Evidence of feral animal species should not indicate an increase in abundance

With regard to natural vegetation sites (1a to 5a), examination of **Figure 14** shows that there is no trend of increasing abundance of feral animals across years at these sites and this is representative of a decrease in feral animals during both 2016 and 2017. Examination of the data across all five years in natural vegetation areas shows a consistent decrease in feral animals, with higher diversity of pest species at site 5a.

Abundance of native animals should not decrease.

The number of arboreal mammals has been higher at the reference sites compared to the woodland sites across the entire five years of monitoring. The first year of monitoring shows the highest total number of arboreal mammals, with a significant decrease over the next two years. 2016 brought this figure back up to one less than the original number and was followed by another significant decrease in 2017. Although this figure has shown a decrease from initial monitoring, the results are highly variable and are likely due to extreme seasonal variations.

Due to the overall low diversity and variability of terrestrial mammals, there are again no clear patterns across monitoring years, however species diversity has not declined at any of the reference sites, with consistently higher numbers at reference site 5a.

Bat diversity has been relatively constant across all years at the reference sites, with an increase at sites 1c and 5a. Sites 1a, 3a and 3b have declined in numbers, however have shown high variability across the whole monitoring program, which suggests other causes such as seasonal variations. Since 2016, bat diversity has increased at four of the seven sites and indeed since monitoring began in 2013 Site 5a, 3b and 10a on the other hand, have shown a pattern of increasing bat diversity across monitoring years, with twice and higher total number of species recorded in 2017 compared with 2013.

Bird numbers have been relatively constant across all years at the natural vegetation sites, with a slight decrease in diversity during 2017 possibly due to monitoring scheduled earlier in spring than previous years, as well as 2017 experiencing drier periods than in previous monitoring years.

Consistently low numbers of reptile species have been observed across all five years of monitoring within the natural vegetation sites, which demonstrates no discernible patterns in diversity between years or sites. Zero reptiles were recorded at sites 1a and 9a during 2017.

Until 2016, there were few clear patterns for amphibian species diversity at reference sites, however 2017 presented only two species compared to up to 15 in past years monitoring. It is likely that drier conditions during 2016 and 2017 compared to previous years may have contributed to these results. In general, amphibian diversity fluctuates greatly between years, and this is likely to reflect variability in weather and climatic factors. Higher dam levels and rainfall in general would assist these numbers and diversity.

3.2.4 Woodland rehabilitation sites: assessment against performance / completion criteria

Evidence of feral animals not significantly greater than in analogue sites

For woodland rehabilitation sites (9a and 10a), **Figure 14** shows an overall decease across monitoring years for all of the rehabilitation sites. Following a spike in feral animal numbers at site 9a during 2014 (driven by large numbers of rabbits), feral animal abundance at all three rehabilitation sites is within the range of abundance seen at the reference sites. There was no notable difference in the types of feral species present at rehabilitation sites compared with reference sites, other than a higher number of rabbits, hares and wild dogs at rehabilitation sites.

Increase in numbers and species of native fauna as rehabilitation develops

Overall species richness was consistently higher at intact (analogue) sites (1a to 5a) compared with rehabilitation sites (9a to 10c), as would be expected given the greater structural complexity and habitat connectivity of the former.

Comparisons between the 2016 and 2017 indicate that arboreal mammals are considerably lower during 2017 monitoring and are also notably lower in the rehabilitation sites compared to their reference sites, which is not unexpected, given that the vegetation is still immature at these sites, and lacks habitat features such as hollows. There is also limited vegetation connectivity within the surrounding landscape to allow movement of arboreal mammals into rehabilitation sites.

The range of diversity of terrestrial mammals at the rehabilitation sites is consistent with reference sites. Diversity has increased at sites 5a, 9a and 10a across the five year monitoring program, and shown high variability across the entire five years.

In reference to microbats, the woodland rehabilitation sites have shown substantial variability across the five years of monitoring. Bat diversity has been consistently lower overall at rehabilitation sites compared with reference sites, which is likely a reflection of the relatively isolated nature of the vegetation at the rehabilitation sites and the lower availability of habitat features such as hollows for roosting. It is likely that the bats recorded on these sites are using the habitat for foraging rather than roosting.

Bird diversity at the rehabilitation sites is still lower overall than at reference sites. This is likely due to the rehabilitation sites being isolated patches of vegetation in the landscape, with a dominant immature vegetation and less habitat features than reference sites. Bird diversity and numbers have fluctuated across the entire monitoring program at rehabilitation sites; however, there is no apparent trend of increasing diversity. It is expected that increases in bird diversity will occur over the longer term, once vegetation has matured and habitat features such as hollows have developed.

Reptile species diversity has remained constant at sites 10a and 10c across all five years of monitoring (one species), and at site 9a it has varied between zero and two species. There is no apparent pattern of increase in diversity across years, however given that reptile diversity at rehabilitation sites is within the range of diversity seen at reference sites, there is no need for current intervention.

No amphibian species were recorded at rehabilitation sites during 2016 or 2017 monitoring. Although this appears to represent a decline in diversity since the commencement of monitoring, it is likely that drier conditions during both years compared to previous years is the probable explanation for these results. Amphibian diversity fluctuates consistently between years, and this is likely to reflect variability in weather and climatic factors. Site-characteristics are also influential, for example, site 9a has amphibians recorded for only one out of five years; however, this site is located along the top of a hill with no wet areas.

4 Conclusions and recommendations

This section provides recommendations for land management within each monitoring area. Recommendations for future monitoring are also provided.

After review of the complete five years of monitoring data, ELA strongly recommends that a restructure of the monitoring strategy is undertaken to achieve good outcomes and assist in meeting any future criteria. The final year of monitoring concluded a few changes regarding design of the monitoring program, which include:

- Realignment of transects for the purpose of travelling across vegetation types and sites rather than through vegetation types. This will result in more accurate floristic data, specific to vegetation types and communities;
- A reduction in monitoring sites across the six vegetation types. Clear and substantial results can still be obtained from a reduced number of monitoring sites, perhaps three per vegetation type, which will save time, money and unnecessary data handling;
- ELA found a number of sites were missing monitoring equipment such as start and end stakes of transects. All sites need this to enable efficient field work in a timely manner as well as ensuring accurate data sampling each year;
- ELA strongly recommend discussions with Drayton to propose a reduction in the number of monitoring events from annual to perhaps biannual. Results have shown significant variation between years, most likely due to weather and climate fluctuations which effect flora and fauna results. This reduction may also assist in presenting more meaningful results, particularly if recommended actions have not been applied and rehabilitation works are not yet successful.

4.1 Southern Offset, Great North Tip, Far East Tip, South Tip and Geofluv

- The Spotted-tail Quoll, listed as endangered under the EPBC Act and vulnerable under the BC Act, was not recorded this year in the Southern Offset (site 5a). This does not mean the species no longer resides here, so as recommended in previous years, due to the potential vulnerability of this species to 1080 (sodium fluoroacetate), fox, cat and rabbit baiting should not be undertaken within an exclusion zone around the creekline habitat in the Southern Offset, and any baiting in the surrounding areas should use precautions including burying meat baits to a depth of at least 10 cm and avoidance of baiting during the peak breeding season of this species (July to September).
- ELA recommends the placement of hollow logs and piles of large rocks / boulders in the rehabilitation areas around site 5a and in the broader Southern Offset rehabilitation areas. At present there is little available denning habitat for Spotted-tail Quolls outside the creekline in which they have been recorded. Provision of supplementary habitat features may increase the potential habitat for this species and thus increase the viability of the population.
- All of the woodland rehabilitation sites in the Southern Offset are underperforming for the criterion of <20% weed cover, with weed cover up to 92% at some sites. All of these sites require intervention to bring them in line with the ROMP performance criteria. Intervention in early stages of rehabilitation will help to reduce weed competition with the newly established native plantings. Error! Reference source not found. provides a list of the main weed species that should be argeted at each monitoring site.

- Five out of ten woodland rehabilitation sites 6a, 8b and 10a requiring priority intervention are not meeting targets for bare ground and may require intervention. To help reduce bare areas and increase native groundcover, application of soil amelioration and native seed is recommended.
- Community structure diversity needs attention to increase each structure of vegetation and cover. This can occur via direct seeding and planting out of all structural layers. A focus on ground layer species would also assist in encouraging resilience and self-sustainability of the low ground layer community.
- All woodland rehabilitation sites within the Southern Offset area have exhibited zero to low native grass and ground cover since monitoring began, and all have 0% canopy cover. Since management intervention in the Southern Offset area included direct seeding in 2015 and revegetation works continuing into 2016 and 2017, three out of the 10 sites have increased their community structures for the canopy and midstorey layers. If ground, shrub, and canopy cover does not occur, targeted intervention will be required. This could include spraying out strips of exotic groundcover and seeding these areas with native species, for example, continued monitoring is recommended for all of these sites to determine the progress of current rehabilitation activities in the area.
- An appraisal of tubestock losses was completed in June 2017 and presented to DP&E. Planting of tubestock has been discontinued in favor of direct seeding.

4.2 Drayton Wildlife Refuge and Northern Offset

- Continued management of exotic plant species is required in order to maintain quality habitat in the Wildlife Refuge and Northern Offset. The most widespread weeds are *Opuntia* spp., *S. madagascariensis*, *C. gayana, E. curvula*, *P. clanestinum*, *G. pubescens* and *H. hirta,* all of which are found in some combination at most monitoring sites. These species should be prioritised for control to prevent further spread.
- Ongoing vertebrate pest control (rabbit, cat and fox) is recommended.

4.3 Great North Tip, Far East Tip, South Tip and Geofluv

- Pasture rehab site 11a, 11d, 11f, 11g, 11h and 11i represent low pasture species cover and requires intervention. These low pasture species covered is likely due to the very high exotic species cover present at this site; weed species are likely outcompeting target pasture species. This score is expected to improve if targeted weed control is undertaken at this site.
- The current species composition of the pasture rehab sites is not ideal for successful grazing, and intervention would be required at most sites (11a, 11c, 11d, 11h and 11i) in order to achieve the nominated targets. Intervention could involve spraying out strips of existing pasture and seeding these areas with target species, in order to introduce more palatable pasture species.
- Pasture rehab sites 11c, 11h and 11i had one species (*P. clandestinum*) comprising 75-80% cover on site. These sites are considered to require intervention in order to meet targets for reducing single-species dominance. This could include spraying out strips of the site where *P. clandestinum* is dominant, followed by seeding with a range of other pasture species to increase diversity.
- Despite an increase since last year, none of the pasture rehab sites are currently meeting the targets with regard to diversity of perennial species. Further direct seeding may be required in order to increase the diversity of suitable perennial pasture species. As the sites all exhibit high levels of groundcover, it may be necessary to first spray out strips of grass in order to create space for seeding.
- Ongoing vertebrate pest control (rabbit and fox) is recommended.

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Appendix A : Flora species list 2017

Scientific Name	Common Name	1a	1b	1c	2a	3a	3b	3c	4a	5a	6a	7a	7b	8a	8b	9a	10a	10b	10d	10e	11a	11b	11c	11d	11f	11g	11h	11i
Acacia baileyana	Cootamundra Wattle																1	1	1									
Acacia binervata	Two-veined hickory																	1										
Acacia decora	Western Silver Wattle										1		1							3								
Acacia falcata				2							1		1															
Acacia implexa	Hickory Wattle					2	2	2					2							2								
Acacia ligulata	Dune Wattle																	1										
Acacia salicina	Cooba										1	1						3		3								
*Acacia saligna**	Golden Wreath Wattle															4	4		3							3		
Ajuga australis	Austral Bugle						1																					
Allocasuarina luehmannii	Bulloak	3	2	3		3	1	1	1																			
*Anagallis arvensis**	Scarlet Pimpernal	1			1		1		1	1	2	3	2	2	1	2	2	2		1	1	1	1			2	2	1
Aristida ramosa	Purple Wiregrass	3	3	3	2	3	3	3	3	4			2	1											3		2	
Aristida ramosa var. speciosa										4																		
Aristida spp.		2																										
Aristida vagans	Threeawn Speargrass	1	2		1		1		2																			
Asperula spp.									1																			
Asphodelus fistulosus	Onion Weed												1				1									1	2	2
Asteraceae spp.				1																								
Aster subulatus	Shrub Aster																1											
Atriplex semibaccata	Australian Saltbush									1																		
Austrostipa aristiglumis	Feather Speargrass																								4			
Austrodanthonia spp.		1	1	1														2							1			
Austrostipa scabra	Rough Speargrass	2				1	1												1									
Austrostipa verticillata	Slender Bamboograss									1																		
*Bidens pilosa**	Farmers Friend					1	1				1	1					1			1	1	1			1	1	1	
*Bidens subalternans**												1																
Bothriochloa decipiens	Piited Bluegrass				2												2	1	1			2	3		2		2	
Bothriochloa macra	Red-leg Grass												2															
Brachychiton populneus	Kurrajong															1												
Brassica spp.*				1																								

Scientific Name	Common Name	1a	1b	1c	2a	3a	3b	3c	4a	5a	6a	7a	7b	8a	8b	9a	10a	10b	10d	10e	11a	11b	11c	11d	11f	11g	11h	11i
Breynia oblongifolia	Coffee Bush	1		1				3																				
*Briza minor**	Shivery Grass				1				1																			
Brunoniella australis	Blue Trumpet	1	2	2		2																						
Bursaria spinosa	Blackthorn			1																								
Calotis cuneifolia	Blue Burr-daisy	1	2	2	1	1	2	1	1																			
Calotis lappulacea	Yellow Burr-daisy	2					1			1																		
Carex inversa	Knob Sedge			1																								
*Carthamus lanatus**	Woolly Distaff Thistle								1																	1	1	1
Cassinia arcuata	Drooping Cassinia	1																										
Chamaesyce drummondii	Flat Spurge		1																									
Cheilanthes sieberi	Poison Rock Fern	2	2	2	1	1	2	2	2	1																		
*Chloris gayana**	Rhodes Grass					1				1		3	2	3		2	2	2	3	1	4	2	4		2	2		
Chloris spp.		1	2	2																								
Chloris truncata	Finger Grass												1															
Chloris ventricosa	Plump Windmill Grass					1	2		1	1															1			
Chrysocephalum apiculatum	Everlasting	2			1		1	2	2																			
*Cirsium vulgare**	Spear Thirslt				1									1		2					1		1					1
Convolvulus erubescens	Blushing Bindweed					1											1						1					
*Conyza bonariensis**	Fleabane													1						1								
*Conyza sumatrensis**	Tall Fleabane					1					1			1		1	1			1	2	1	2				1	
Corymbia maculate	Spotted Gum											2	2		1	1	3	2	1	2								
Cymbopogon refractus	Barbed-wire Grass	2	2	2	1	2	2	2	3	1									2				1				2	
*Cynodon dactylon**	Couch	1			2		1			1	4		3	3		3		3	2	3	2	2	3		2	3		
Cyperus gracilis	Slender Flat Sedge									?																		
Cyperus spp.										2																		
Daucus glochidiatus	Australian Carrot						1																					
Daviesia ulicifolia	Gorse Bitter Pea			2																								
Desmodium brachypodum	Large Tick-trefoil						1																					
Desmodium varians	Slender Tick-trefoil			1																								
Dianella caerulea	Blue Flax Lily			1						1																		
Dianella revoluta	Baby Bliss	1	1	2			2	2																				
Dichopogon fimbriatus	Chocolate lily		2																									
Dichondra repens	Kidney Weed		2	1		1	2			2							2											

Scientific Name	Common Name	1a	1b	1c	2a	3a	3b	3c	4a	5a	6a	7a	7b	8a	8b	9a	10a	10b	10d	10e	11a	11b	11c	11d	11f	11g	11h	11i
Dichanthium sericeum	Queensland Bluegrass										2		2	1				2										
Digitaria diffusa			2	2		2	2																					
Digitaria spp.*																										1		
Dodonaea viscosa	Sticky Hopbush												2													1		
Echinopogon caespitosus	Hedgehog Grass							1																				
Echinopogon ovatus	Forest Hedgehog Grass			1																								
*Ehrharta erecta**	Panic Veldtgrass					1																						
Einadia nutans	Climbing Saltbush						1			1																		
Einadia polygonoides	Knotted Goosefoot		1																									
Enchylaena tomentosa	Ruby Saltbush									2																1		
Enteropogon acicularis	Curly Windmill Grass									1																		
Eragrostis brownii	Brown's Lovegrass			2	1		1	2	1																			
*Eragrostis curvula***	African Lovegrass		2		1				1																			
Eragrostis leptostachya	Paddock Lovegrass	1		1		1	1																					
Eremophila debilis	Winter Apple	1	2	1			2			1																		
Eriochloa pseudoacrotricha	Cup Grass												1					2										
Erodium crinitum	Hairy Blue Heron's-bill											1		1						2	1				1	1		2
Eucalyptus sp														1														
*Eucalyptus cladocalyx**	Sugar Gum																3	3	3									
Eucalyptus crebra	Narrow-leaved Ironbark	3	3	3			1							1														
Eucalyptus spp.											1			1	1					2	1							
Eucalyptus melliodora	Yellow Box									3									1									
Eucalyptus moluccana	Grey Box		4	4	1	1	2		1																			
Eucalyptus tereticornis	Forest Red Gum			1		4	4	5	1	1								1										
Exocarpos cupressiformis	Native Cherry					2																						
*Facelis retusa**	Annual Tramweed								1																			
*Galenia pubescens**	Galenis									3				3	3	2					1				2	2		
Galium aparine	Cleavers															3												
Galium gaudichaudii	Rough Bedstraw				1	1																2						
Geranium solanderi	Australian Cranesbill				1		1													1			1					1
Glycine clandestina	Twining Glycine	2		1		1		1																				
Glycine tabacina	Variable Glycine	2	2	1		2	2			1		1	1			1	1	1		1							1	
Gnaphalium americanum	Cudweed				1				1																			

Scientific Name	Common Name	1a	1b	1c	2a	3a	3b	3c	4a	5a	6a	7a	7b	8a	8b	9a	10a	10b	10d	10e	11a	11b	11c	11d	11f	11g	11h	11i
*Gomphocarpus fruticosus**	Narrow-leaved Cotton Bush													1		3	1			1	2	1	1		1		2	2
Goodenia spp.					1		1		1																			
Haloragis heterophylla					1																							
Hardenbergia violacea	False Sarsparilla						1				1		1	1			1											
Hibbertia obtusifolia	Hoary Guinea-flower						1	2																				
*Hydrocotyle laxiflora**	Stinking Pennywort					2																						
*Hyparrhenia hirta***	Coolatai								1		3	2	2			5	3		2				1		2			
Hypericum gramineum	Small St. John's Wort	1		1			1																					
*Hypochaeris radicata**	Flatweed				2	1	1	2	2																			
Indigofera australis	Australian Indigo										1		3															
*Juncus acutus**	Spiny Rush					2																						
Juncus subsecundus	Fingered Rush						1																					
*Juncus usitatus**	Common Rush		1																									
Lamiaceae spp.					2				1																			
Laxmannia gracilis	Slender Wire Lily	2		2		1	1	2																				
Lepidium spp.*							1																					
Lily spp.		1				1	1																					
Linum marginale	Native Flax								1																			
Lissanthe strigosa	Peach Heath			1			1	1																				
Lomandra filiformis	Savannah Blue	2	2	2	2		2	2	3																			
Lomandra longifolia	Spiny-head Mat-rush					4				1																		
Lomandra multiflora	Many-flowered Mat-rush	1	2	2	1	1	2	1																				
*Medicago polymorpha**	Burr-medic											1	2				2				1	3	2		2	2		
*Medicago sativa**	Lucerne										1	1	2	1		1		1	1	2	2	1	2			1		
*Melinis repens**	Rose Natal Grass										3		2		2		3	2	3	2								
Mentha spp.*		1																										
Microlaena stipoides	Weeping Grass	2	2	1	1	2		1		1																		
*Modiola caroliniana**	Bristly-fruited Mallow													1														
Myoporum montanum	Boobialla			1										1														
Notelaea microcarpa	Velvet Mock Olive		1	1		1																						
Opercularia diphylla	Coarse Stinkweed		1	1			1																					
*Opuntia humifusa*** ***	Devil's-tongue	2	3	1		1	2	1	1																			1
*Opuntia stricta*** ***	Common Prickly Pear	1	1			1	1			1		2				1		1										

Scientific Name	Common Name	1a	1b	1c	2a	3a	3b	3c	4a	5a	6a	7a	7b	8a	8b	9a	10a	10b	10d	10e	11a	11b	11c	11d	11f	11g	11h	11i
Oxalis perennans	Yellow Woodsorrow							1																				
Oxalis spp.						1	1																					
Ozothamnus diosmifolius	Dogwood				1			1																				
Panicum coloratum	Kleingrass									1	2	3	2			1	2						1			4		
Panicum effusum	Hairy Panic				1		1		1																			
Panicum spp.								1						3	5													
Paspalum spp.*																1							2					
*Paspalum dilatatum**	Dallis Grass										1																	
Paspalum urvillei	Vasey Grass																2											
Pennisetum clandestinum	Kikuyu										2			4		2				2		3			2	2	5	6
Phalaris aquatica	Harding Grass																					3	2		2	2	1	
Phylanthus spp.											1							1										
Phytolacca octandra	Red Ink Plant													1														
Pimelea linifolia	Queen of the Bush																1											
*Plantago lanceolate**	Plantain				3	2		1	1			2	2	1		3	2	2	2		3	3	3		4	2	2	2
Plantago spp.						2			1																			
Poa spp.*										1																		2
Pratia purpurascens	White Root			2																								
Pultenaea microphylla	Small-leaved Bush-pea	1	1	2																								
*Rapistrum rugosum**	Turnip Weed													2						1		1				2	2	2
*Romulea rosea**	Onion Grass				1				1																			
Schoenus brevifolius	Zig-zag Bog-rush		2																									
*Senecio madagascariensis*** ***	Fireweed	1	1	1	2	1	1	1	1	1	1	2	2	1			2	2		1	2	1	2				1	2
Setaria parviflora	Marsh Bristle-grass													1														
Setaria sphacelata	Tall African Grass																1		1									
Sida spp.													1															
*Sida rhombifolia**	Paddy's Lucerne					1				1	1		1	1		1			1	1					2	1	1	1
*Sida spinose**	False Mallow									1																		
*Silybum marianum**	Saint Mary's Thistle																									1		1
Solanum americanum	American Black Nightshade														1													
*Solanum nigrum**	Black Nightshade		1																									
Solanum spp.											1														1		1	
Solanum prinophyllum	Forest Nightshade	1					1																					

Scientific Name	Common Name	1a	1b	1c	2a	3a	3b	3c	4a	5a	6a	7a	7b	8a	8b	9a	10a	10b	10d	10e	11a	11b	11c	11d	11f	11g	11h	11i
*Soliva sessilis**					1				1																			
*Sonchus asper**	Prickly Sow-thistle																					1	2			2	1	
*Sonchus oleraceus**	Sow-thistle										1	2						1		1	1				2			
Spartothamnella juncea	Bead Bush						1															1						
Sporobolus creber	Slender Rat-tail Grass				3					1	1	3																
*Stachys arvensis**	Staggerweed				1																		1		1		1	1
Stackhousia viminea	Slender Stakhousia					1																						
Swainsona galegifolia	Darling Pea										1		3															
*Tagetes minuta**	Stinking Roger												2									1				1		
Tribulus micrococcus	Spineless Caltrop														1													
*Trifolium arvense**	Hare's-foot Clover																						1					
*Trifolium campestre**	Field Clover																				2							
*Trifolium glomeratum**	Clustered Clover																					2						
*Trifolium repens**	White Clover															1						3						
*Verbena bonariensis**	Purpletop									1						1						2	1					1
*Verbena brasiliensis**	Brazilian Vervain				2				1					1						1		2						
*Verbena rigida var. rigida**	Veined Verbena				2				2																			
Vernonia cinerea	Little Ironweed		1	1		1																						
Vicia spp.*																2					1		2		1	1	2	1
Vittadinia spp.																	1	2	1			1	1					
Vittadinia dissecta	Brunonia																		1			1						
Vulpia spp.					1																							
Wahlenbergia communis	Tufted Bluebell	1		1				1														1						
Wahlenbergia gracilis	Asian Wildflower	1	1							1																		
*Xanthium occidentale***	Noogoora Burr														2										1			
Unidentified herb					2				1																			
Unidentified Fabaceae				1			1																					

1 Few individuals (less than 5% cover)
2 Many individuals (less than 5% cover)
3 5 % – less than 20% cover
4 20 % - less than 50% cover
5 50% - less than 75% cover
6 >75%

Note * = Non-native species; ** = State priority weed species; *** = Weed of National Significance

Appendix B : Biometric survey results 2017

Vegetation Type	Area	Plot	Reference or Rehab Sites	No. Native Plant Species	Native Over Storey Cover (%)	Native Mid Storey Cover (%)	Native Grass Cover (%)	Native Shrub Cover (%)	Native Other Cover (%)	Bare ground (%)	Exotic Plant Cover (%)	No. Trees w/ Hollows	Overstorey Regen (proportion)	No. fallen Logs
Grey Ironbark - Spotted Gum - Grey Box	Drayton Wildlife Refuge	1a	Reference		27.5	15	32	2	10	2	0	3	1	15
Grey Ironbark - Spotted Gum - Grey Box	Drayton Wildlife Refuge	1b	Reference		25.5	0.5	8	0	18	4	0	1	1	8
Grey Ironbark - Spotted Gum - Grey Box	Northern offset	1c	Reference		30.5	4.6	14	8	12	0	0	0	1	16
Grey Ironbark - Spotted Gum - Grey Box	Drayton Wildlife Refuge	2a	Reference (DNG)		4	0	58	0	2	2	44	0	1	0
Forest Red Gum - Grey Gum	Drayton Wildlife Refuge	3a	Reference		25.1	3	16	0	92	0	0	1	1	33
Forest Red Gum - Grey Gum	Drayton Wildlife Refuge	3b	Reference		54	0	54	0	0	0	0	54	0	0
Forest Red Gum - Grey Gum	Northern offset	3c	Reference		30	3.5	18	2	10	8	0	0	1	0
Forest Red Gum - Grey Gum	Drayton Wildlife Refuge	4a	Reference (DNG)		0	0	54	0	54	0	8	0	1	0
Forest Red Gum - Grey Gum	Southern offset	5a	Reference		29.5	0	30	0	2	10	36	1	1	40
Grey Ironbark - Spotted Gum - Grey Box	Southern offset	6a	Rehab		0	0	0	2	2	18	68	0	0	0
Grey Ironbark - Spotted Gum - Grey Box	Southern offset	7a	Rehab		0	0	0	0	0	6	52	0	0	0
Grey Ironbark - Spotted Gum - Grey Box	Southern offset	7b	Rehab		0	0	6	10	0	8	76	0	0	0
Forest Red Gum - Grey Gum	Southern offset	8a	Rehab		0	0	0	0	4	4	92	0	1	2
Forest Red Gum - Grey Gum	Southern offset	8b	Rehab		0	0	0	0	0	16	62	0	1	0
Forest Red Gum - Grey Gum	Southern offset	9a	Rehab		6	0	0	0	0	2	92	0	1	0
Woodland rehab	Great North Tip	10a	Rehab		21.5	0	0	0	0	16	51	0	0	0
Woodland rehab	Great North Tip	10b	Rehab		9	6.5	0	8	0	20	24	0	0	0
Woodland rehab	Great North Tip	10d	Rehab		23	0	2	0	0	16	39.6	0	0	0
Woodland rehab	Great North Tip	10e	Rehab		26	0	0	4	0	2	78	0	0.5	0
Pasture rehab	Great North Tip	11a	Rehab		0	0	0	0	4	4	90	0	0	0
Pasture rehab	Great North Tip	11b	Rehab		0	0	0	0	0	2	60	0	0	1
Pasture rehab	Great North Tip	11c	Rehab		0	0	2	0	2	0	90	0	0	2
Pasture rehab	Great North Tip	11d	Rehab		0	0	28	0	0	2	68	0	0	0
Pasture rehab	South Tip	11f	Rehab		0	0	14	0	0	2	86	0	0	0

Vegetation Type	Area	Plot	Reference or Rehab Sites	No. Native Plant Species	Native Over Storey Cover (%)	Native Mid Storey Cover (%)	Native Grass Cover (%)	Native Shrub Cover (%)	Native Other Cover (%)	Bare ground (%)	Exotic Plant Cover (%)	No. Trees w/ Hollows	Overstorey Regen (proportion)	No. fallen Logs
Pasture rehab	Geofluv	11g	Rehab		0	0	0	0	0	0	74	0	0	0
Pasture rehab	Far east tip	11h	Rehab		0	0	0	0	2	0	98	0	0	0
Pasture rehab	Far east tip	11i	Rehab		0	0	2	0	0	0	98	0	0	0

Appendix C : Flora site photographs across three monitoring periods 2013-15-17

Site 1a start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

Site 1b start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

Site 1c start 2013 - 2015 - 1017

End 2013 - 2015 - 2017

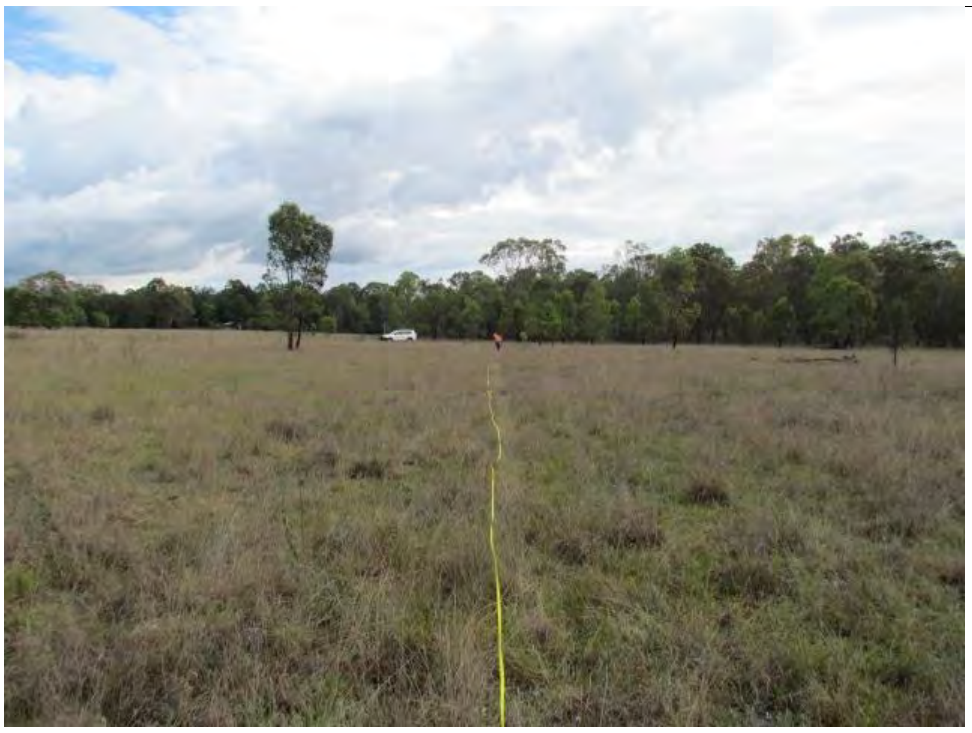
Site 2a start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
No site in 2013	NO sites in 2013
	
	

Site 3a start 2013 - 2015 - 1017

End 2013 - 2015 - 2017

Site 3b start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

Site 3c start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

Site 4a start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
No site in 2013	No site in 2013
	
	

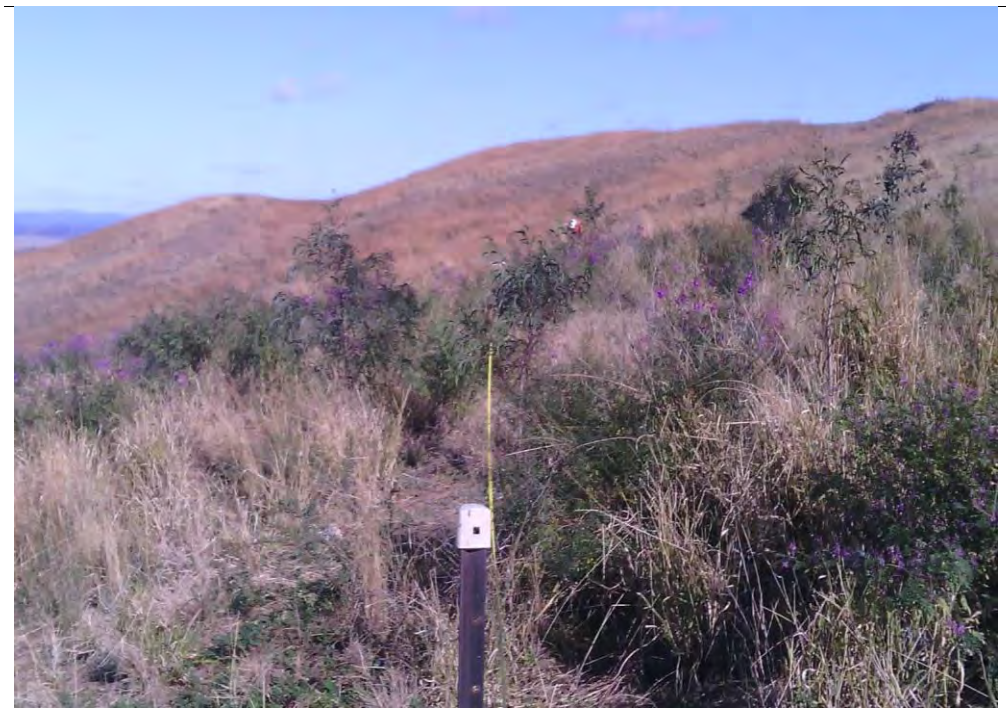
Site 5a start 2013 - 2015 - 1017

End 2013 - 2015 - 2017

Site 6a start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	No image available
	
	

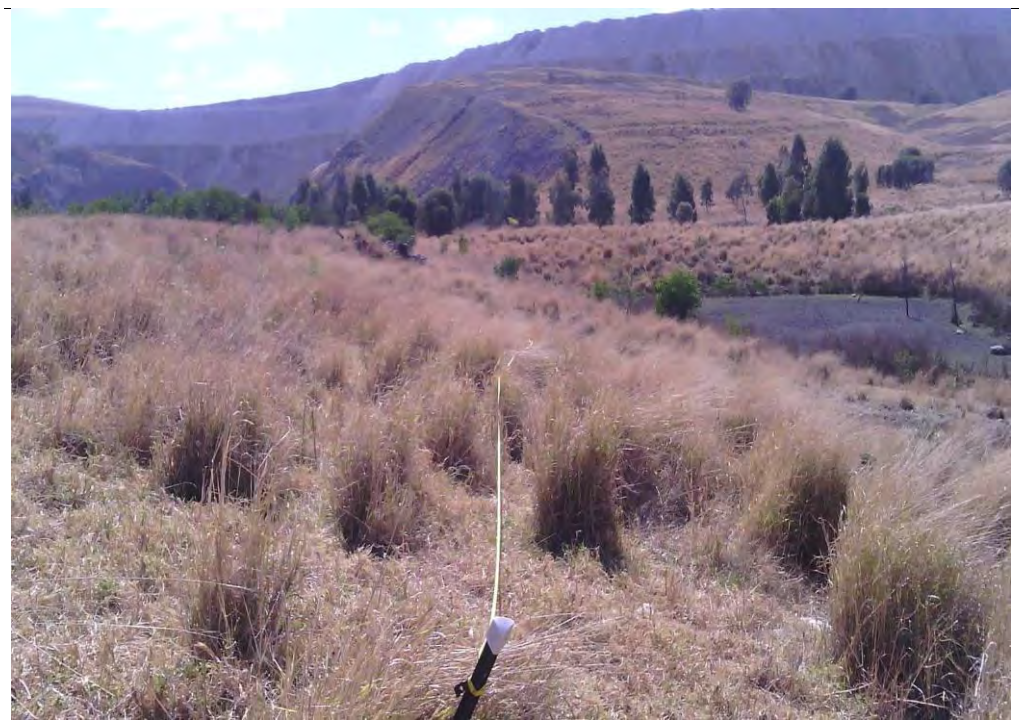
Site 6b start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
No image available	No image available
No longer monitored	No longer monitored
No longer monitored	No longer monitored

Site 7a start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	No image available
	
	

Site 7b start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	No image available
	
	

Site 8a start 2013 - 2015 - 1017

End 2013 - 2015 - 2017



Site 8b start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

Site 9a start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	No image available
	
	

Site 9b start 2013 - 2015 - 1017	**End 2013 - 2015 - 2017**
	
No longer monitored	**No longer monitored**
No longer monitored	**No longer monitored**
No longer monitored	**No longer monitored**

Site 10a start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

Site 10b start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
No image available	No image available
	
	

Site 10c start 2013 - 2015 - 1017

End 2013 - 2015 - 2017

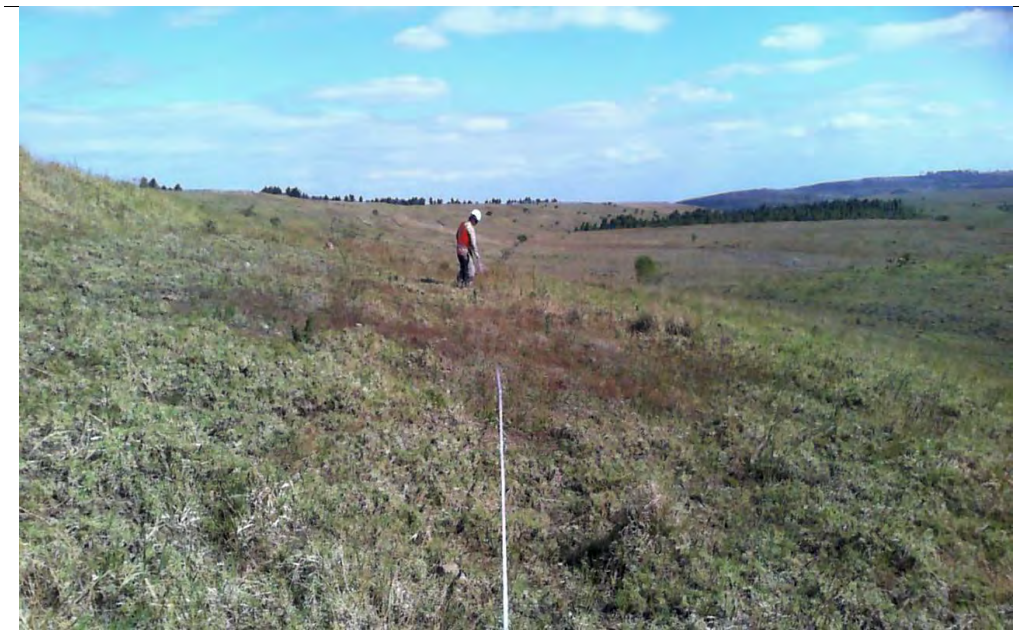
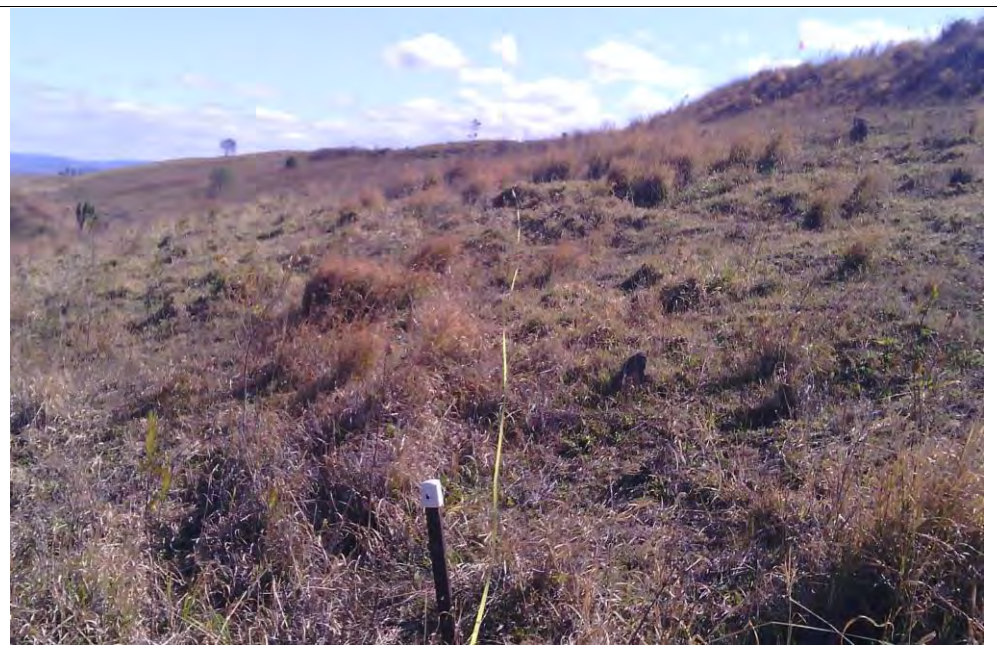
No longer monitored

No longer monitored

Site 10d start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
Not monitored in 2013	Not monitored in 2013
	
	

Site 10e start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
Not monitored in 2013	Not monitored in 2013
	
	

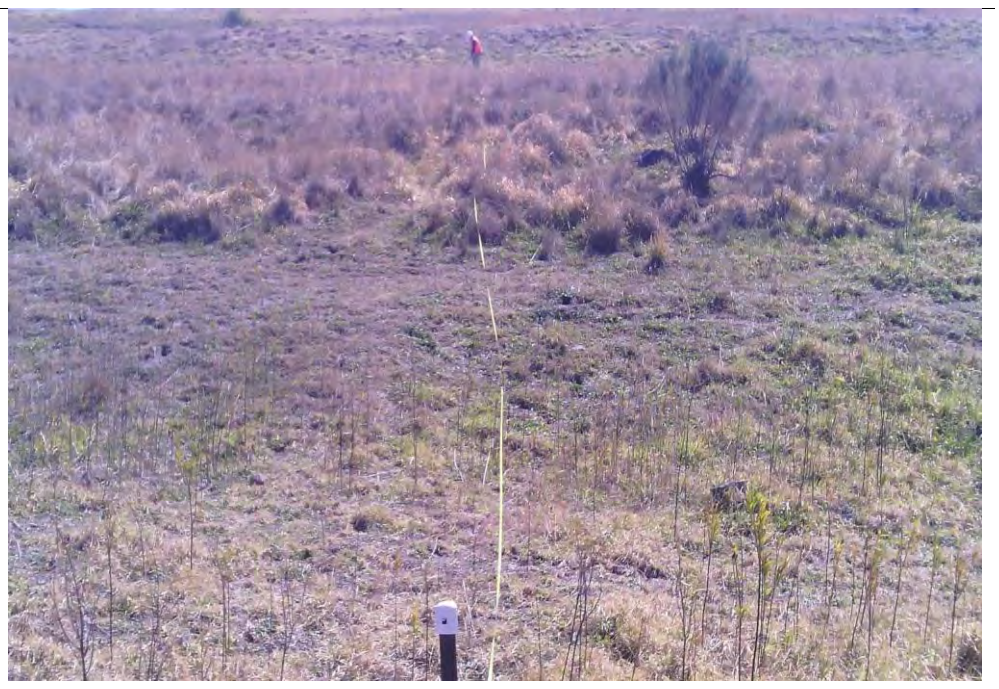
Site 11a start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

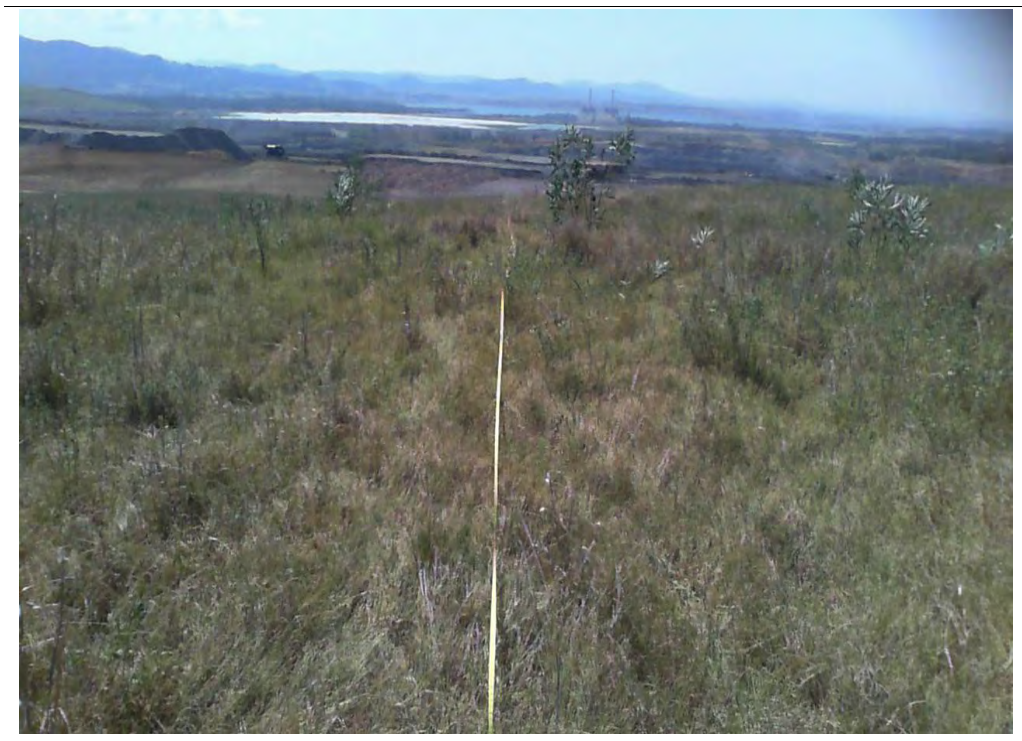
Site 11b start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

Site 11c start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

Site 11d start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
	

Site 11e start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
	
	
No longer monitored	No longer monitored

Site 11f start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
Not monitored in 2013	Not monitored in 2013
	
	

Site 11g start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
Not monitored in 2013	Not monitored in 2013
	
	

Site 11h start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
Not monitored in 2013	Not monitored in 2013
	
	

Site 11i start 2013 - 2015 - 1017	End 2013 - 2015 - 2017
Not monitored in 2013	Not monitored in 2013
	
	

Appendix D : Fauna species list 2017

Class	Scientific Name	Common Name	BC status	EPBC status	Exotic (*)	1A	1C	3A	3B	5A	9A	10A
Amphibia	*Crinia signifera*	Clicking Froglet						x				
Amphibia	*Litoria vereauxii*	Whistling Tree Frog						x				
Aves	*Aegotheles cristatus*	Australian Owlet Nightjar				1						
Aves	*Aquila audax*	Wedge-tailed Eagle									1	x
Aves	*Cacatua galerita*	Sulfur-crested Cockatoo				1	x			1		
Aves	*Caligavis chrysops*	Yellow-faced Honeyeater					1	1	1	x		
Aves	*Colluricincla harmonica*	Grey Shrike-thrush				1					1	
Aves	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike				x						
Aves	*Corcorax melanorhamphos*	White-winged Chough				1		1	1			
Aves	*Corvus coronoides*	Australian Raven				1	1	1	1	1	1	
Aves	*Corvus orru*	Torresian Crow									1	
Aves	*Cracticus nigrogularis*	Pied Butcherbird				1			1	1		1
Aves	*Cracticus tibicen*	Australian Magpie				1	1	1	1	1	1	
Aves	*Cracticus torquatus*	Grey Butcherbird				1		1	1			
Aves	*Dacelo novaeguineae*	Laughing Kookaburra						x		x	1	

Class	Scientific Name	Common Name	BC status	EPBC status	Exotic (*)	1A	1C	3A	3B	5A	9A	10A
Aves	*Falco berigora*	Brown Falcon								x		
Aves	*Gerygone fusca*	Western Gerygone									1	
Aves	*Glossopsitta concinna*	Musk lorikeet						1				
Aves	***Glossopsitta pusilla***	**Little Lorikeet**	**V**						**1**			
Aves	*Grallina cyanoleuca*	Magpie-lark						1				
Aves	*Hirundo neoxena*	Welcome Swallow								1		
Aves	*Malurus cyaneus*	Superb Fairy-wren					1	1	1	1		x
Aves	*Malurus lamberti*	Variegated Fairy-wren				x						
Aves	*Manorina melanocephala*	Noisy Miner				1		1	1	1		
Aves	*Melithreptus brevirostris*	Brown-headed Honeyeater						1				
Aves	*Melithreptus lunatus*	White-naped Honeyeater				1				x		1
Aves	*Nesoptilotus leucotis*	White-eared Honeyeater					1					
Aves	*Oriolus sagittatus*	Olive-backed Oriole				1		1	1			
Aves	*Pachycephala pectoralis*	Golden Whistler					x			1		
Aves	*Pardalotus punctatus*	Spotted Pardalote				1	1	1	1			
Aves	*Pardalotus striatus*	Striated Pardalote					1	1	1	1		
Aves	*Petrochelidon ariel*	Fairy Martin								x		

Class	Scientific Name	Common Name	BC status	EPBC status	Exotic (*)	1A	1C	3A	3B	5A	9A	10A
Aves	*Petroica goodenovii*	Red-capped Robin							1	1		
Aves	*Petroica rosea*	Rose Robin					x					
Aves	*Philemon corniculatus*	Noisy Friarbird					1		1			
Aves	*Platycercus eximius*	Eastern Rosella							1			
Aves	***Pomatostomus temporalis***	**Grey-crowned Babbler**	**V**					**x**				
Aves	*Rhipidura albiscapa*	Grey Fantail				1	1	1	1			1
Aves	*Rhipidura leucophrys*	Willie Wagtail								1		
Aves	*Smicrornis brevirostris*	Weebill				1	1	1	1			
Aves	*Strepera graculina*	Pied Currawong				1	1	1	1		1	
Aves	*Vanellus miles*	Masked Lapwing				x						
Aves	*Zosterops lateralis*	Silvereye										1
Mammalia	*Austronomus australis*	White-striped Freetail Bat				1			1			
Mammalia	*Canis lupis familirais* spp.	Wild Dog			*					1		
Mammalia	***Chalinolobus dwyeri***	**Large-eared Pied Bat**	**V**							1		1
Mammalia	*Chalinolobus gouldii*	Gould's Wattled Bat				1	1	1	1	1	1	1
Mammalia	*Chalinolobus morio*	Chocolate Wattled Bat				1	1	1	1	1	1	1
Mammalia	*Lepus europaeus*	European Hare										1

Class	Scientific Name	Common Name	BC status	EPBC status	Exotic (*)	1A	1C	3A	3B	5A	9A	10A
Mammalia	*Macropus giganteus*	Eastern Grey Kangaroo				1			1			1
Mammalia	*Macropus robustus*	Common Wallaroo									1	
Mammalia	*Macropus rufogriseus*	Red-necked Wallaby								1	1	1
Mammalia	***Miniopterus australis***	**Little Bentwing Bat**	**V**							1		1
Mammalia	***Miniopterus schreibersii oceanensis***	**Eastern Bentwing Bat**	**V**			**1**		**1**	**1**	**1**		**1**
Mammalia	***Mormopterus lumsdenae***	**Southern Freetail Bat**								**1**		
Mammalia	***Mormopterus (Micronomus) norfolkensis***	**Eastcoast Freetail Bat**	**V**			**1**	**1**			**1**	**1**	**1**
Mammalia	*Mormopterus (Ozimops) ridei*	Eastern Freetail Bat							1			1
Mammalia	***Myotis macropus***	**Southern Myotis**	**V**			1			1	1		1
Mammalia	*Nyctophilus sp*	Long-eared Bat				1			1	1		1
Mammalia	*Oryctolagus cuniculus*	Rabbit			*							
Mammalia	*Petaurus breviceps*	Sugar Glider						x				
Mammalia	*Petaurus* spp.									1		
Mammalia	***Saccolaimus flaviventris***	**Yellow-bellied Sheath-tailed Bat**	**V**									
Mammalia	*Tachyglossus aculeatus*	Short-beaked Echidna									1	
Mammalia	*Trichosurus vulpecula*	Common Brushtail Possum				X	X	1x	1	1		

Class	Scientific Name	Common Name	BC status	EPBC status	Exotic (*)	1A	1C	3A	3B	5A	9A	10A
Mammalia	***Vespadelus troughtoni***	**Eastern Cave Bat**	**V**			1	1	1	1	1		
Mammalia	*Vombatus irsinus*	Common Wombat								1		
Mammalia	*Vulpes vulpes*	Fox			*					1		
Mammalia	*Wallabia bicolor*	Swamp Wallaby								1	1	
Reptilia	*Carlia vivax*	Lively Rainbow Skink					x					
Reptilia	*Ctenotus sp.*						x					
Reptilia	*Pseudechis porphyriacus*	Red-bellied Black Snake						x				
Reptilia	Unidentified skink						x	x	x	x		x

1 = songmeter and/or remote camera recording; x = incidental observation

Appendix E : Target planted species for woodland rehabilitation sites

Vegetation type and sites:	Narrow-leaved Ironbark Woodland	Spotted Gum-Grey Box Open Forest and Woodland	Forest Red Gum Open Forest and Woodland (Hunter Lowland Redgum Woodland)	Yellow Box and Grey Gum Woodland (Box-Gum Woodland)	Woodland rehabilitation
	Sites 6a	Sites 7a, 7b	Sites 8a, 8b	Sites 9a	Sites 10a, 10b, 10d, 10e
Overstorey species					
Allocasuarina luehmannii	x	x			x
Angophora floribunda	x				x
Brachychiton populneus	x	x	x	x	x
Eucalyptus albens	x	x	x	x	x
Eucalyptus blakelyi	x	x	x	x	x
Eucalyptus canaliculata	x			x	x
Eucalyptus crebra	x	x	x	x	x
Corymbia maculata	x	x	x	x	x
Eucalyptus melliodora	x	x	x	x	x
Eucalyptus moluccana	x	x	x	x	x

Vegetation type and sites:	Narrow-leaved Ironbark Woodland	Spotted Gum-Grey Box Open Forest and Woodland	Forest Red Gum Open Forest and Woodland (Hunter Lowland Redgum Woodland)	Yellow Box and Grey Gum Woodland (Box-Gum Woodland)	Woodland rehabilitation
	Sites 6a	Sites 7a, 7b	Sites 8a, 8b	Sites 9a	Sites 10a, 10b, 10d, 10e
Eucalyptus punctata			x	x	x
Eucalyptus tereticornis	x	x	x	x	x
Midstorey species					
Acacia decora	x	x	x	x	x
Acacia decurrens					x
Acacia falcata	x	x	x	x	x
Acacia implexa		x	x		x
Acacia paradoxa	x	x	x	x	x
Acacia salicina	x				x
Breynia oblongifolia			x		x
Daviesia ulicifolia		x	x		x
Dodonaea boroniifolia	x	x	x	x	x
Dodonaea viscosa	x	x	x	x	x
Hibbertia obtusifolia		x			x

Vegetation type and sites:	Narrow-leaved Ironbark Woodland	Spotted Gum-Grey Box Open Forest and Woodland	Forest Red Gum Open Forest and Woodland (Hunter Lowland Redgum Woodland)	Yellow Box and Grey Gum Woodland (Box-Gum Woodland)	Woodland rehabilitation
	Sites 6a	Sites 7a, 7b	Sites 8a, 8b	Sites 9a	Sites 10a, 10b, 10d, 10e
Jacksonia scoparia			x		x
Leucopogon juniperinus			x		x
Maireana microphylla	x			x	x
Melichrus urceolatus		x			x
Myoporum montanum	x	x	x	x	x
Notelaea microcarpa	x		x	x	x
Olearia elliptica	x				x
Ozothamnus diosmifolius	x	x	x	x	x
Pultenaea microphylla		x			x
Spartothamnella juncea	x				x
Groundcover species					
Aristida ramosa	x	x	x	x	x
Aristida spp.		x			x
Austrodanthonia spp.	x				x

Vegetation type and sites:	Narrow-leaved Ironbark Woodland	Spotted Gum-Grey Box Open Forest and Woodland	Forest Red Gum Open Forest and Woodland (Hunter Lowland Redgum Woodland)	Yellow Box and Grey Gum Woodland (Box-Gum Woodland)	Woodland rehabilitation
	Sites 6a	Sites 7a, 7b	Sites 8a, 8b	Sites 9a	Sites 10a, 10b, 10d, 10e
Austrodanthonia fulva				x	x
Austrostipa verticillata				x	x
Bothriochloa macra	x	x	x	x	x
Calotis cuneifolia		x			x
Calotis lappulacea		x	x	x	x
Cheilanthes sieberi subsp. sieberi		x	x		x
Cheilanthes spp.		x			x
Chloris ventricosa	x			x	x
Chrysocephalum semipapposum	x	x	x		x
Convolvulus erubescens	x				x
Cymbopogon refractus	x	x	x	x	x
**Cynodon dactylon*			x	x	x

Vegetation type and sites:	Narrow-leaved Ironbark Woodland	Spotted Gum-Grey Box Open Forest and Woodland	Forest Red Gum Open Forest and Woodland (Hunter Lowland Redgum Woodland)	Yellow Box and Grey Gum Woodland (Box-Gum Woodland)	Woodland rehabilitation
	Sites 6a	Sites 7a, 7b	Sites 8a, 8b	Sites 9a	Sites 10a, 10b, 10d, 10e
Danthonia racemosa var. racemosa		x	x		x
Danthonia spp.	x	x	x		x
Desmodium brachypodum	x	x		x	x
Desmodium varians	x	x		x	x
Dianella longifolia	x	x			x
Dianella revoluta	x	x	x		x
Dichondra repens		x		x	x
Digitaria brownii	x				x
Digitaria diffusa	x	x	x		x
Echinopogon caespitosus var. caespitosus			x		x
Einadia nutans		x		x	x
Eragrostis leptostachya	x	x	x		x
Eremophila debilis	x	x	x		x

Vegetation type and sites:	Narrow-leaved Ironbark Woodland	Spotted Gum-Grey Box Open Forest and Woodland	Forest Red Gum Open Forest and Woodland (Hunter Lowland Redgum Woodland)	Yellow Box and Grey Gum Woodland (Box-Gum Woodland)	Woodland rehabilitation
	Sites 6a	Sites 7a, 7b	Sites 8a, 8b	Sites 9a	Sites 10a, 10b, 10d, 10e
Glycine canescens	x	x			x
Glycine spp.		x	x		x
Hardenbergia violacea	x	x	x	x	x
Lomandra spp.		x			x
Microlaena stipoides var. stipoides		x	x		x
Pratia purpurascens			x		x
Themeda australis	x	x	x	x	x

Appendix F : Target species for pasture rehabilitation areas

Introduced species

Introduced species listed are either seeded in pasture areas or naturalised exotics with moderate to high forage value in pasture areas.

Family	Scientific Name	Common Name	Forage value	Annual / perennial
Asteraceae	*Cichorium intybus*	Chicory	High	Perennial
Brassicaceae	*Brassica napus*	Forage Brassica	High	Annual
Fabaceae	*Lupinus angustifolius*	Narrow-leaved Lupin	High	Annual
Fabaceae	*Medicago lupulina*	Black Medic	High	Annual
Fabaceae	*Medicago minima*	Woolly Burr Medic	High	Annual
Fabaceae	*Medicago polymorpha*	Burr Medic	High	Annual
Fabaceae	*Medicago sativa*	Lucerne	High	Perennial
Fabaceae	*Medicago truncata*	Barrel Medic	High	Annual
Fabaceae	*Trifolium incarnatum*	Crimson Clover	High	Annual
Fabaceae	*Trifolium repens*	White Clover	High	Perennial
Fabaceae	*Trifolium subterraneum*	Subterranean clover	High	Annual
Fabaceae	*Vicia sativa*	Common Vetch	High	Annual
Poaceae	*Avena spp*	Oats	High	Annual
Poaceae	*Chloris gayana*	Rhodes Grass	Moderate	Perennial
Poaceae	*Dactylis glomerata*	Cocksfoot	High	Perennial
Poaceae	*Digitaria smutsii*	Digit grass	Moderate	Perennial
Poaceae	*Echinochloa utilis*	Japanese Millet	High	Annual
Poaceae	*Fescue arundinaceae*	Tall Fescue	High	Perennial
Poaceae	*Lolium perenne*	Perennial Ryegrass	High	Perennial
Poaceae	*Lolium rigidum*	Wimmera Ryegrass	High	Annual
Poaceae	*Megathyrsus maximus*	Green Panic	Moderate	Perennial
Poaceae	*Melinis repens*	Red Natal Grass	Moderate	Perennial

Family	Scientific Name	Common Name	Forage value	Annual / perennial
Poaceae	*Panicum coloratum*	Bambatsi panic	Moderate	Perennial
Poaceae	*Panicum maximum*	Green Panic	Moderate	Perennial
Poaceae	*Paspalum dilatatum*	Paspalum	High	Perennial
Poaceae	*Pennisetum clandestinum*	Kikuyu Grass	Moderate	Perennial
Poaceae	*Phalaris aquatica*	Phalaris	Moderate	Perennial
Poaceae	*Setaria sphacelata*	Setaria	Moderate	Perennial
Poaceae	*Urochloa panicoides*	Liverseed grass	High	Annual

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