

Coolmore Australia & Darley
Australia
Drayton South Coal Project
Peer Review of Acoustic & Blasting
Impacts

Report 03

Final | 12 October 2015

This report takes into account the particular
instructions and requirements of our client.

It is not intended for and should not be relied
upon by any third party and no responsibility
is undertaken to any third party.

Job number 243820-00

Arup
Arup Pty Ltd ABN 18 000 966 165

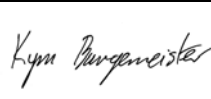


Arup
Level 17
1 Nicholson Street
East Melbourne VIC 3002
Australia
www.arup.com

ARUP

Document Verification

ARUP

Job title		Drayton South Coal Project		Job number	
				243820-00	
Document title		Peer Review of Acoustic & Blasting Impacts		File reference	
Document ref		Report 03			
Revision	Date	Filename	Arup Report.docx		
Final	12 Oct 2015	Description	Final		
			Prepared by	Checked by	Approved by
		Name	Frank Butera	Kym Burgemeister	Frank Butera
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
Issue Document Verification with Document ☒					

Contents

	Page
Executive Summary	1
1 Introduction	3
1.1 Arup overview	3
2 Bridges Acoustics – Acoustic Impact Assessment Drayton South Coal Project Environmental Impact Assessment dated 1 April 2015	5
2.1 Executive Summary – Page I-3 Paragraph 4 & 5	5
2.2 Executive Summary – Page I-3 Paragraph 9	5
2.3 Section 3.1.1 Mt Arthur Coal Mine EA Page I-11 Paragraph 3	6
2.4 Section 3.2 Drayton South – Long Term Noise Survey Page I-12 Paragraph 1	7
2.5 Section 3.4 Drayton South – Adopted Background Levels Page I-14 Paragraph 1	8
2.6 Section 4.2 Where Criteria May be Exceeded Page I-18	8
2.7 Section 4.9 Blast Over-Pressure and Vibration Page I-21	9
2.8 Section 5.1 Noise Assessment Method Page I-22	10
2.9 Section 5.3.1 Engineering Controls for Mobile Equipment Page I-28	11
2.10 Section 5.6 Predicted Mining Noise Levels Page I-33	12
2.11 Section 10 Blast Over-Pressure and Vibration Page I-45	13
2.12 Noise and Vibration from Blasting Summary:	13
3 Kannegieter Equine Specialists – Equine Health Impact Assessment dated March 2015	14
3.1 Section 6.1 Existing Baseline Noise Levels Page J-53	14
3.2 Section 6.3 EIS Acoustic Assessment Predictions Page J-53	14
3.3 Section 6.4.2 Project Levels Page J-56	14
3.4 Section 6.4.3 Edinglassie Stud Page J-56	14
3.5 Section 6.4.4 Conclusions Stud Page J-57	14
3.6 Section 6.6 Noise Level Discussion Page J-58 Paragraph 6	15
3.7 Blasting associated with Equine health summary	15
4 Hansen Bailey - Drayton Mine Extension – Background Document dated December 2014	16
4.1 Section 1.3 Noise and Blasting Paragraph 2	16
5 Department’s Report – August 2015	17
5.1 Executive Summary	17

5.2	Department's Review of Bridges Acoustics Report	17
5.3	Department's Report – Section 6.3.2 Noise	19
5.4	Department's Report – Section 6.3.3 Blasting and Vibration	19
5.5	Appendix D – Response to Submissions dated July 2015	19
6	Summary	20

Executive Summary

Arup Pty Ltd (Arup) has been retained by Coolmore Australia and Darley Australia to undertake an assessment of the noise and vibration from blasting from the proposed Drayton South Coal Project. Anglo American (Anglo) currently operates the existing Drayton Coal Mine and proposes to commence new mining operations on land to the south of the existing mine.

Bridges Acoustics and Kannegieter have prepared reports with respect to the assessment of noise and vibration from blasting for the proposed project.

However, the reports do not provide confidence with respect to the assessment of noise and vibration from blasting, that all aspects of the project have been completed in an adequate and proper manner according to current “best practise” assessments and methodologies. Details where the assessment has failed to provide adequate information are summarised below:

- Bridges Acoustics provides no evidence that the proposed project will continuously comply with the project noise limits. Bridges Acoustics demonstrate that exceedance will occur at the nearby noise sensitive receivers in excess of the Industrial Noise Policy noise limits.
- It is fundamental at EIS stage that noise and vibration prediction models are calibrated and validated for local conditions. The predictions reported by Bridges Acoustics for noise and vibration from blasting have not been validated. There remains a high risk that the predictions are inaccurate.
- There is a high risk that the background noise measurements are no longer appropriate for the assessment of the project. There is no evidence to suggest that best practise calibration processes have been adopted or that the noise and vibration equipment used in the EIS study maintained appropriate certification at the time of the assessment measurement period.
- ANZECC 1990 is generally acceptable to control damage to structures, however it should not be the only guideline when considering the effect of ongoing ground vibration and over-pressure associated with blast events to humans or animals. Noise and blast vibration should be compared against appropriate human response guidelines and standards such as:
 - *Assessing Vibration: A Technical Guideline (NSW DEC 2006)*
 - *Australian Standard AS ISO 2631.2:2014 Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration. Part 2: Vibration in buildings (1 Hz to 80)*
 - *International Standard ISO 10137 Basis for design of structures – Serviceability of buildings and walkways against vibrations.*
- Bridges Acoustics have undertaken noise modelling using ENM software. ENM is no longer maintained or supported by its developer RTA Technologies (RTA). Further, RTA encourage the use of modern noise modelling software to complete environmental noise assessments. ENM is not considered best practice and is not commercially available. Hence there is no

means for a reliable transparent assessment. It is our understanding that ENM was the only environmental noise software considered by Bridges Acoustics.

- Bridges Acoustics undertakes an assessment based on Year of development. However, there is no explanation of the activity being undertaken for that Year or scenario. Typically noise models are based on detailed assumptions (validated by the mine operator) regarding the location (including mine depth), type of and number of equipment and machinery to be used in each year scenario considered. However, in this instance, this information is not provided.
- The levels of noise mitigation proposed are at the very highest level considered feasible by earth moving equipment manufacturers. Insufficient information is provided to verify that this level of noise mitigation can and will be achieved. If noise mitigation targets are not achieved the noise generated by the project will be higher than predicted.
- Kannegieter relies on noise and vibration findings detailed by Bridges Acoustics to complete the assessment to the horse studs. For reasons set out in this report the Bridges Acoustics findings are not considered reliable or representative of the likely noise and vibration impacts associated with the proposed mine. It is not considered appropriate to assess vibration impacts associated with the equine industry against ANZECC 1990. This standard does not consider the impacts to human or animal comfort.

In summary, the noise and vibration assessment is incomplete. It does not demonstrate a true representation of the current or future noise and blast vibration impacts to the nearby noise sensitive community surrounding the proposed development.

1 Introduction

Arup Pty Ltd (Arup) has been retained by Coolmore Australia and Darley Australia to undertake a review of the noise and vibration from blasting impacts from the proposed Drayton South Coal Project. Anglo American (Anglo) currently operates the existing Drayton Coal Mine and proposes to commence new mining operations on land to the south of the existing mine.

Anglo submitted a new development application and Environment Impact Statement (EIS) in May 2015. It is our understanding that Anglo have proposed to transfer their operations to the ridgeline south of the Whynot and Blakefield Pits and north of Redbank and Houston Pits.

The NSW Planning and Environment (Department) based their findings on Bridges Acoustics, *Acoustic Impact Statement* dated 1 April 2015. The Department has not requested a third party expert review of the acoustic submission. As a result, it is our understanding that the Department has relied on the findings of Bridges Acoustics to evaluate their assessment for noise and vibration from blasting impacts.

This assessment is a review of the following documents:

- Bridges Acoustics – *Acoustic Impact Assessment Drayton South Coal Project Environmental Impact Assessment* dated 1 April 2015.
- Kannegieter Equine Specialists – *Equine Health Impact Assessment* dated March 2015
- Hansen Bailey – *Drayton South Coal Project, Response to Submissions* dated July 2015.
- NSW Government Planning & Environment – *State Significant Development Assessment, Drayton South Coal Project (SSD 6875)*, dated August 2015.
- Secretary's Environmental Assessment Requirements – Application Number 14_6875, date of issue 19 December 2014.
- Hansen Bailey – *Response to Submissions* dated July 2015, which includes *Appendix D – Drayton South Project Year 9 Noise Levels* prepared by Bridges Acoustics.

1.1 Arup overview

Arup has a specialist acoustics group focusing on sound, noise and vibration consulting services. Since our founding in 1980, Arup Acoustics has built a strong network of over 150 staff worldwide, with offices in the Americas, Europe, Asia and Australia. Our strength lies in our people, many of whom are leaders in their specialist fields. Arup Acoustics is connected by a strong global technical infrastructure, providing communication, resources, databases and information archives.

Arup Acoustics has significant experience in environmental, mining and industrial noise and vibration assessments. Arup has the expertise to assess the impact of noise and vibration for all industrial applications including:

- Mining
- Oil and Gas Exploration
- Desalination & port facilities - underwater and marine impacts
- Manufacturing
- Energy and Renewable sector.

Environmental Impact Assessments for existing and proposed facilities are undertaken using the latest in acoustic prediction software including, SoundPLAN and Integrated Noise Model (INM). Working with Arup's sophisticated Geographic Information Systems (GIS) teams Arup produces spatially accurate noise and vibration modelling. Arup has undertaken noise impact assessments for local and international groups including BHP Billiton, AngloGold Ashanti and Gladstone Area Water Board (GAWB).

2 Bridges Acoustics – Acoustic Impact Assessment Drayton South Coal Project Environmental Impact Assessment dated 1 April 2015

The following section is a review of Bridges Acoustics EIS submission. The submission has been reviewed based on Arup's experience in preparing environmental noise impact assessments.

2.1 Executive Summary – Page I-3 Paragraph 4 & 5

This paragraph details that noise levels will exceed the project noise limits by 2 – 5 dB(A). Should this project proceed then Anglo American will be granted permission to exceed the noise limits prescribed by the NSW INP. In our opinion it is fundamental that compliance with the noise limits is achieved and demonstrated at the EIS phase.

Bridges Acoustics provides no evidence that the proposed project will continuously comply with the project noise limits. Bridges Acoustics suggests that machinery and equipment will be attenuated, however the EIS presents non-compliance against the INP. There are no attempts to mitigate noise emitted from the proposed development to comply with the INP noise limits.

Community expectations rely on the EIS at the Development Application stage to demonstrate compliance with the project noise limits. The EIS presents non-compliance with the INP even when the noise mitigation and attenuation measures are applied.

RISK ASSESSMENT: It is fundamental at EIS stage that noise emissions from industry demonstrate compliance with the project noise limits. This assessment does not clearly define “worst case” assessments. Hence, there is a high risk that noise emitted from the mine may continuously exceed the INP noise limits.

2.2 Executive Summary – Page I-3 Paragraph 9

It is our understanding that Drayton Mine is an existing mine operation. The existing mine would most likely have undertaken ground vibration and over-pressure monitoring which could be used to help guide or validate the current assessment. It is best practise to understand the impacts of blast and over-pressure from the existing mine site. It is common to validated noise and blast vibration modelling to local conditions.

This is considered standard and best practice for a new mine by the same operator in a similar geographic location. It is particularly important for noise and vibration modelling where the stated purpose of the assessment is to define and assess noise and vibration impacts based on worst case scenarios to all noise sensitive receives.

For this assessment Bridges Acoustics fails to validate or calibrate the noise or vibration blasting model. It is inappropriate to have completed an EIS associated with an existing Drayton mine site and not incorporate an “existing conditions” assessment for noise and vibration. Failure to complete this task and validation of the model, increases the uncertainty of the results.

The report prepared by Bridges Acoustics for Aston Resources Pty Ltd, titled *Acoustics Impact Assessment, Maules Creek Coal Project, Environmental Assessment, Report J0130-41-R3*, dated 4 July 2011, makes the following statement:

Section 4.11 Page 31

Blast effects have been calculated using equations in Appendix J of AS2187. Ground and groundwater conditions, and their effect on vibration propagation through the ground, are difficult to quantify and would tend to vary from one area to the next within the Project Boundary and surrounding area.

This comment confirms that ground vibration assessments are only estimates based on generic information within the standard and are “difficult to quantify”.

Bridges Acoustics has not provided an appropriate level of detail to fully understand the impacts for ground vibration. This is unacceptable because:

- The extraction of minerals, generally requires a comprehensive understanding of ground type and configuration.
- The existing mine currently has vibration and over-pressure data associated with blasting events.
- The ground vibration and over-pressure models have not been calibrated to local conditions. The results are generic and not specific to the site or surrounds.

The use of previous blast studies to verify and validate predictions is not uncommon. In the report prepared by Bridges Acoustics for Boggabri Coal Pty Limited titled *Acoustic Impact Assessment, Continuation of Boggabri Coal Mine, Environmental Assessment Report J0130-30-R2* dated 12 October 2012, Bridges Acoustics verified vibrations predictions with historical data obtained from the existing mine operation.

RISK ASSESSMENT: It is fundamental at EIS stage that where possible prediction models are calibrated for local conditions. The predictions reported by Bridges Acoustics have not been calibrated. There remains a high risk that the predictions are not as accurate as they could otherwise be.

2.3 Section 3.1.1 Mt Arthur Coal Mine EA Page I-11 Paragraph 3

Bridges Acoustics have applied an inconsistent methodology when undertaking the assessment of background noise measurements to establish project noise limits.

Bridges Acoustics details that background noise measurements conducted for the noise assessment at Mt Arthur Coal Mine were adversely impacted by existing noise from the Drayton Mine. As a result these measurements were excluded for use on the Drayton South Coal Project. An acceptable approach.

It is best practice to avoid and exclude noise sources that may impact the “true” background or ambient noise conditions. Generally, an attended assessment may be considered to monitor other intrusive noise or an alternative representative receiver position may be considered. In this instance Bridges Acoustics have not provided alternative representative locations or demonstrated that background noise monitoring has not been adversely affected by intrusive noise sources.

Since the background noise levels are considered when developing the project noise limits, accurate monitoring of the background noise levels is essential. Failure to undertake representative background noise levels is likely to result in “creeping background”¹.

Based on the information presented in Table 6 of Bridges Acoustics submission there are numerous notations of mine noise being audible during the noise measurement period. It is our understanding these measurements were undertaken in 2011, however have not been verified for the April 2015 EIS submission completed by Bridges Acoustics.

RISK ASSESSMENT: There is a high risk that the background noise measurements obtained for the project are inappropriate. This may result establishing higher project noise limits.

2.4 Section 3.2 Drayton South – Long Term Noise Survey Page I-12 Paragraph 1

Background noise measurements were completed by Bridges Acoustics between 23 June 2011 to 5 July 2011.

We provide the following comments:

- Background noise measurements were undertaken four (4) years prior to completing the EIS. Bridges Acoustics does not provide commentary detailing the acceptability of these earlier measurements for the 2015 assessment. Further, there is no understanding of the potential for change in the background noise levels in the vicinity of noise sensitive receivers for the duration of the project.
- Ideally, verification that the 2011 background noise measurements are suitable for the current application should have been undertaken.
- It is best practise to eliminate noise measurements undertaken during school holiday periods. In 2011 the mid-year school holiday period occurred between 2 – 17 July 2011. Background noise measurements during school holiday periods are to be excluded from the assessment or alternatively provide

¹ This term is used to describe the situation when other industrial noise sources impact the measured background noise level, resulting in ongoing increases in project limits being prescribed. This is not the intent of the Industrial Noise Policy (INP). It is not best practise to accept background noise data that has been adversely influenced by other mining operations.

commentary detailing the acceptability of background noise measurements during this period.

It is common practise to provide details of the equipment calibration used for long term background noise measurements. Further, commentary detailing that calibration occurred on the noise monitoring device pre and post measurements period should be provided and is considered best practise. There is no evidence that equipment calibrations occurred at any stage of the project.

RISK ASSESSMENT: There is a high risk that the background noise measurements are no longer appropriate for the assessment of the project. There is no evidence to suggest that best practise calibration processes have been adopted or that the equipment used in the noise study maintained NATA Certification at the time of the noise measurement period.

2.5 Section 3.4 Drayton South – Adopted Background Levels Page I-14 Paragraph 1

Bridges Acoustics and Hansen Bailey suggest that the Golden Highway is a *dominant* noise source in the vicinity of noise sensitive receivers. However, traffic data to support this claim has not been provided. In the *Traffic and Transport Impact Assessment* prepared by DC Traffic Engineering Pty Ltd dated 8 August 2012, Section 2.3.1 RMS traffic surveys Page V-21, details traffic counts for the Golden Highway. The data relied on was obtained in 1980 and 2004, with 1,800 and 2,400 vehicles/day respectively. There was no daily distribution of traffic counts, however, simple distribution for a 24 hour period suggests that 100 vehicles/hour or less than 2 vehicles per minute. This implies a relative low level of traffic volume along the Golden Highway. Hence, unlikely to be the *dominant* noise as suggested by Bridges Acoustics and Hansen Bailey.

RISK ASSESSMENT: There is a moderate risk that road traffic noise does not predominately influence the background noise level in the vicinity of noise sensitive receivers.

2.6 Section 4.2 Where Criteria May be Exceeded Page I-18

This section appears to be misleading. The INP does not encourage non-compliance of the Project Specific Noise Limits (PSNL). The INP may provide noise strategies that should be considered when non-compliance has been determined. The intent of the policy is to demonstrate continuous compliance with the PSNL's during the planning and EIS phases. Knowing that during operational periods there may be periods of unforeseen noise exceedance.

Bridges Acoustics has not demonstrated that compliance with the INP is likely to be achieved at all of the nearest affected noise sensitive receivers. It will be a result of ineffective acoustic planning if the project is permitted to proceed without demonstrating that the PSNL's can be achieved. Further, should the project proceed a permit will be issued allowing the project to exceed the INP noise limits. This is not the intent of the INP.

RISK ASSESSMENT: There is a high risk that the project will continuously exceed the project noise limits.

2.7 Section 4.9 Blast Over-Pressure and Vibration Page I-21

Bridges Acoustics refers to *Australian Standard 2187.2 – 2006 Explosives – Storage and use, Part 2: Use of explosives*. The regulatory framework suggests to also consider the use of *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZECC)*.

The ANZECC guidelines suggests blast limits to control damage to structures and states the following:

2.2.3 *Experience has shown that for almost all sites a ppv of less than 1 mm/sec is generally achieved. It is recognised that this is not practicable to achieve a ppv of this level at all sites and hence a recommended maximum of 5 mm/sec has been selected. However, it is recommended that a level of 2 mm/sec (ppv) be considered as the long term regulatory goal for the control of ground vibration.*

ANZECC criteria is generally acceptable for structures, however it is not acceptable for ongoing ground vibration and over-pressure associated with blast events to humans or animals. A more appropriate assessment for ground vibration and over-pressure blast events should be to comply with requirements detailed in the following Australian and International Standards:

1. Australian Standard AS ISO 2631.2:2014 *Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration. Part 2: Vibration in buildings (1 Hz to 80)*
2. International Standard ISO 10137 *Basis for design of structures – Serviceability of buildings and walkways against vibrations*
3. Assessing Vibration: A Technical Guideline. NSW DEC 2006

It is noted that ANZECC was published 1990 and that the ANZECC organisation is no longer operational. Human or animal comfort compared against ANZECC in 2015 is not considered “best practise”. ANZECC should be used as guide in conjunction with current Australian and/or International Standards.

ANZECC 1990 is not considered the relevant standard for impacts of noise and vibration to animal houses associated with research hospitals². Based on Arup’s experience with animal houses there is a zero detection policy is required to

² Animals bred within animal research laboratories are the result of many generations of breeding. This is critical when producing the appropriate animal to undertake a specific medical trial. It is our understanding that due to the specific bred of the animal there tends to be an increased sensitivity to noise and vibration. Based on Arup’s experience with animal laboratories, it is fundamental for the safety of the animals that no change in noise or vibration occurs during periods of internal or external building construction activity. This results in providing noise mitigation to the laboratory or relocating the animals during periods of building construction. During these construction periods the animals are continuously supervised to assess any behaviour, health or social changes.

ensure that research animals are not adversely impacted. As a minimum the above mentioned Standards are to be considered for the proposed project.

RISK ASSESSMENT: Compliance with ANZECC is generally acceptable for structures, however not considered the most appropriate guideline for the assessment of human or animal comfort. Compliance with ANZECC will adversely impact on human and animal comfort at nearby sensitive locations.

2.8 Section 5.1 Noise Assessment Method Page I-22

Bridges Acoustics uses a software package known as ENM. ENM was developed in the early in 1990's, however is no longer supported, maintained or distributed by the developer RTA Technology (RTA). Further, RTA encourage the use of modern environmental noise modelling software such as SoundPlan or CadnaA.

ENM is no longer commercially available, hence it is unlikely further revisions of the INP³ would prescribe the specific use of ENM. The EPA or NSW Planning & Environment do not have the capability to operate ENM and on that basis are unable to verify noise predictions completed by Bridges Acoustics. For these reasons ENM is not considered best practise.

It should be noted that in September 2015 the NSW EPA released the *Draft Industrial Noise Guideline* (Draft Guidelines). If the Draft Guidelines are implemented the following areas in the Bridges Acoustics EIS will no longer be considered compliant:

- There are significant changes to *Best Management Practise* to control noise emissions. The Draft Guidelines considers noise mitigation at the *receiver* to be the least-preferred option and should only be considered once all other options have been exhausted.
- The *new* sleep disturbance noise limit has significantly altered and the approach considered by Bridges Acoustics will be invalid.
- The assessment of temperature inversion conditions are described using stability category instead of temperature lapse rate. Hence, since ENM is no longer supported it is unlikely to be adopted for Draft Guidelines. Further, the draft conditions considered by the Department would also be in error.

RISK ASSESSMENT: The noise model has not been calibrated for local conditions and has been developed with software that is no longer considered industry best practise. For these reasons there is a high risk that the results are inappropriate. This is a limitation of the ENM software.

Further, since ENM is no longer supported RTA Technologies it cannot be adopted to upgrades within the Draft Guidelines.

³ The current version of the NSW INP was issued in 2000. In September 2015 the NSW EPA released *Draft Industrial Noise Guideline*. There are significant difference in the assessment procedures between the INP released in 2000 and the proposed changes issued as a draft in September 2015.

2.9 Section 5.3.1 Engineering Controls for Mobile Equipment Page I-28

Bridges Acoustics suggests that additional noise control will be provided to mobile equipment to allow for a reduction in noise emitted from the mine site. It is our understanding that noise modelling has been undertaken with noise control treatment incorporated to the mobile equipment.

The assessment suggests that by incorporating noise mitigation there will be a further noise reduction of 2 – 9 dB(A) dependent on the equipment selection. However the dozer may be reduced by up to 19 dB(A). This is a significant predicted noise reduction which must be supported by detailed information from the equipment manufacturer. If the proposed noise mitigation is not achieved there is likely to be increased operational noise at the receiver positions and in some scenarios exceed the INP noise limits. Resulting in non-compliance to a greater number of receivers than has been demonstrated in the EIS.

The report fails to provide supporting manufacturer's information. In most cases the reported "noise mitigation" proposed is at the very highest level considered feasible by earth moving equipment manufacturers. There is no evidence that the reduction will be achieved, there is no make, model or operating load of the equipment being considered. This is important because in many cases the introduction of noise control to equipment may impact on the reliability and operating capacity of the equipment.

It is unclear from the EIS if the equipment will be newly purchased for the Drayton South Coal Project or if earth moving equipment will be transferred from the existing Drayton Mine site. No specific equipment has been nominated in the assessment. Based on the EIS it is difficult to understand if machinery equipment that has been specified was verified or validated by Anglo.

If the equipment is to be re-used it is appropriate that noise measurements taken at the existing Drayton mine be considered. It is expected and considered to be industry best practice to undertake noise measurements of the actual or similar equipment used in the noise assessment. The noise data relied on for acoustic modelling must be verified. There is insufficient information with respect to the origins, type or repeatability of the noise data relied on for the noise assessment. Bridges Acoustics have advised the data was collected by other firms (Spectrum Acoustics, Global Acoustics & Wilkinson Murray *and others*) at *other* mine sites not owned or operated by Anglo American. These include Mt Arthur Coal Mine and Bengalla Mine.

Bridges Acoustics does not provide reliably referenced information with respect to the location or quantity of equipment within the noise model. Bridges Acoustics has applied a duration correction⁴ to equipment without verifying the appropriateness for the duration of the equipment. The noise model assumes all equipment is stationary as point sources. Ideally, mobile equipment is to be considered as a moving noise source with defined routes. There is no clarification

⁴ The correction applied when equipment is not operating.

of the appropriateness of modelling mobile noise sources as stationary noise sources.

The absence of relevant information with respect to machinery and the presumption that “worst case” events have been assessed is misleading. Bridges Acoustics have not defined the characteristics of worst case events. Anglo American have not verified that Bridges Acoustics’ assumptions are appropriate.

However, Bridges Acoustics and Hansen Bailey provide commentary to suggest that “worst case” scenarios have been assessed.

Bridges Acoustics undertakes an assessment based on Year of development. However, within Section 5.6 Predicted Mining Noise Levels, there are no details of activity being undertaken for that Year or scenario. Information such as mine depth, number of equipment and location are typical of noise modelling requirements.

Bridges Acoustics have developed an All Year noise plot, however do not provide an explanation of how such a noise plot has been developed. This plot has no supporting information and is not useful for the noise assessment, yet the Department provides commentary to its acceptability.

RISK ASSESSMENT: There is a high risk the noise plots are likely to be inaccurate for the following reasons:

- Noise model has not been calibration for local conditions.
- No supporting referenced noise sources.
- No supporting confirmation that the appropriate machinery has been adequately considered for the scenario being assessed.
- Worst case events have not been defined or assessed.
- Insufficient information to verify that noise mitigation targets can or will be achieved.

2.10 Section 5.6 Predicted Mining Noise Levels Page I-33

Presented in Table 19 is a summary of noise levels at nearby residential properties. The noise levels in the Table include the use of “additional” noise mitigation detailed in Section 5.3. Table 19 demonstrates during the evening and night-time period the noise emissions will not comply with the project noise limits.

There is no evidence that the noise impacts of the proposed additional extraction of 1.4 ROM tonnes from the existing Drayton mine has been included in this assessment. For instance the noise plots in Appendix C (Figure C4) do not indicate extraction at Drayton mine has been considered and appears to be limited to those associated with the CHPP.

RISK ASSESSMENT: There is high risk of non-compliance with the project noise limits. Bridges Acoustics relies on “additional” noise mitigation and the

assumption that Bridges Acoustics has accurately assessed the location and type of equipment required for each scenario however supporting evidence has not been provided.

2.11 Section 10 Blast Over-Pressure and Vibration Page I-45

The ground vibration and over-pressure assessment has been undertaken based on the criteria for “control of damage” to structures. There is no assessment that investigates the impact on human or animal comfort.

RISK ASSESSMENT: There is a high risk that compliance with ANZECC is likely to adversely impact on human and animal comfort at nearby sensitive locations.

2.12 Noise and Vibration from Blasting Summary:

We provide the following information;

- Background noise measurements to establish noise limits were undertaken in 2011 and no further noise monitoring has been presented.
- The noise monitoring was partially completed during a school holiday period which is generally not permitted.
- The noise monitoring was adversely impacted by other mine sites or mine activities and should be evaluated to determine its appropriateness when establishing project noise limits.
- Machinery equipment noise emissions have been assessed on the assumption that noise mitigation has been applied. However, there is no supporting documentation from the manufacturer confirming the reduction in noise level is appropriate or that Anglo will adopt the noise mitigation.
- Earth moving equipment Make, Model and load capacity has not been identified.
- The noise modelling has been undertaken with software no longer considered to be best practise. The noise model has not been calibrated to represent existing operations or local conditions. Due to this neither Arup, nor the Department nor the PAC can independently assess the validity of the outcomes.
- The noise modelling demonstrates an exceedance of the project noise limits.
- The blasting criteria has been established for control of damage to structures. Human and animal comfort criteria have not been applied or considered.

3 Kannegieter Equine Specialists – Equine Health Impact Assessment dated March 2015

The following is a review of Section 6 of Kannegieter's submission. Arup have reviewed noise and vibration aspects of the report.

3.1 Section 6.1 Existing Baseline Noise Levels Page J-53

Kannegieter relies on noise monitoring undertaken by Bridge Acoustics. These noise measurements were undertaken in 2011 and are likely to have been impacted by existing mine operations or mine sources.

3.2 Section 6.3 EIS Acoustic Assessment Predictions Page J-53

This section assumes that the Bridges Acoustics assessment is acceptable and provides a reliable prediction of noise from the proposed mining activities. For reasons set out earlier in this report, the noise predictions in the Bridges Acoustics assessment are not reliable and may not be representative of worst case or operational scenarios.

3.3 Section 6.4.2 Project Levels Page J-56

Kannegieter incorrectly states that over-pressure occurs during helicopter landings. Kannegieter does not establish or verify this claim and it has not been identified within the Bridges Acoustics report. It is unlikely that over-pressure will be detected during helicopter landings. Over-pressure is a shock wave also considered as an impulse wave. Kannegieter has not developed a conclusive argument to suggest that blasting over-pressure is similar to thunder (or lighting) or helicopter landings.

3.4 Section 6.4.3 Edinglassie Stud Page J-56

Kannegieter refers to over-pressure measurements conducted at Edinglassie Stud. However, the results of Edinglassie assessment have not been provided within Kannegieter report nor is the referenced material available within the EIS.

3.5 Section 6.4.4 Conclusions Stud Page J-57

The conclusions provided by Kannegieter are inappropriate. Kannegieter suggests that the criteria assessed by Bridges Acoustics for ground vibration for damage to structures is considered suitable for assessing the impact on horses. There is no assessment that considers human or animal comfort in either Bridges Acoustics or Kannegieter submissions.

3.6 Section 6.6 Noise Level Discussion Page J-58 Paragraph 6

Kannegieter refers to the existing traffic noise levels along the Golden Highway and suggests that traffic volumes will double in 15 years. Based on traffic projections by DC Traffic Engineering Pty Ltd traffic volumes have increased by 25% between 1980 and 2004. Approximately 1% per annum.

Kannegieter's information is misleading and not supported by Anglo's traffic engineering reports. There is no basis to suggest that traffic noise will significantly increase. In general a doubling of the traffic volumes will result in a 3 dB(A) increase in noise level.

3.7 Blasting associated with Equine health summary

Kannegieter relies on Bridges Acoustics or other specialist to draw a conclusion of no negative impacts during blasting events. Since Kannegieter does not provide original findings, the questionable conclusions within the Bridge Acoustics report have been compounded by Kannegieter. Some comments are misleading these include:

- The use of building structure ground vibration limits (ANZECC, 1990) to assess the impact to horse reactions. This section has not been assessed appropriately.
- The correlation between over-pressure and thunder and helicopters is questionable.
- The use of blasting events that occurred at Edinglassie Stud without providing supporting material. This information cannot be verified.
- The report does not adequately assess the potential noise and ground vibration impacts of the project on the studs.

4 Hansen Bailey - Drayton Mine Extension – Background Document dated December 2014

4.1 Section 1.3 Noise and Blasting Paragraph 2

.... the new project application to ensure background noise levels experienced at both horse studs are no higher than the existing background noise levels. ...

This comment is misleading as the assessment undertaken by Bridges Acoustics does not consider the above statement and refers to the noise assessment methodology detailed in the NSW Industrial Noise Policy (INP). There is no evidence to suggest that the above comment has been assessed or will be achieved. The EIS demonstrates that there will be an exceedance of the INP noise limits.

5 Department's Report – August 2015

5.1 Executive Summary

The Department acknowledges that minimising noise and vibration emitted from the proposed development is critical to the ongoing success of the nearby breeding studs. This is outlined in:

Page iii Paragraph 8

... The Minister's terms of reference asked the Commission to assess merits of the project as a whole, with a particular focus on the potential impacts of the project on the operations of Coolmore and Woodlands horse studs, and recommend any additional measures required to avoid and/or minimise the potential impacts of the project on the horse studs.

Based on Arup's review of the Department's Report, the report does not provide any additional measures to address concerns previously raised by the horse studs.

The Department suggests that:

Page v Paragraph 4

... Anglo would need to employ best management practice on site during any mining operations, and minimise the impacts of the project the Coolmore and Woodland studs.

Based on Arup's review of the information before the Commission, there is insignificant noise and vibration impact minimisation strategies or monitoring to provide with confidence that "best management practice" has been considered. Instead Anglo American, Bridges Acoustics and the Department have predominately accepted the project Terms of Reference. These Terms of Reference may be acceptable to "typical" excavation applications, however do not specifically address the impacts to Coolmore and Woodlands studs.

5.2 Department's Review of Bridges Acoustics Report

A review of the Department's report suggests that several questionable assumptions considered by Bridges Acoustics have been accepted without discussion. These include:

- Bridges Acoustics or Anglo American do not provide adequate information that demonstrate continuous compliance of the INP noise limits at all noise sensitive receivers. Instead the Department accepts that it is appropriate for the project to continue to exceed the State policy noise limits.
- The EIS does not provide adequate information to justify the use of background noise measurements undertaken in 2011. The EIS does not justify the use of background noise measurements undertaken during school holiday periods, which are often excluded.

- The EIS does not provide adequate information which suggests that noise monitoring equipment used to complete the background noise measurements maintained adequate calibration certification in accordance with industry best practise.
- The Department does not consider the use of ANZECC's long term mandatory goals for noise and blast vibration at sensitive receivers. In conjunction with ANZECC 1990 it is suggested that the Department should consider the use of current Australian or International Standards.
- The EIS does not assess the impact of over-pressure or blast vibration for human or animal comfort.
- The Department accepts the use Environmental Noise Model (ENM) software. This software is no longer commercially available or supported by the developer. ENM is not considered industry best practise and the developer of ENM encourages the use of modern environmental software packages.
- The noise modelling is incomplete and there is uncertainty in the following areas:
 - The noise, over-pressure and ground vibration models have not been calibrated for local conditions. It is expected for an existing mine operation to monitor mine activities. This information is commonly used to validate and calibrate theoretical models to local conditions. It is fundamental to understand the value correction relationship between theoretical and local conditions.
 - The number of noise sources is not defined for each scenario. The relationship between mobile noise sources as stationary noise sources is not defined.
 - There is no evidence to confirm that the assumptions implemented by Bridges Acoustics are supported by Anglo American. Such as location, duration or type of equipment.
 - The noise modelling relies on noise sources with significant noise attenuation. However, details regarding the effectiveness of noise mitigation and machinery operations has not been detailed or supported by the manufacturers.
- It is unusual for the Department not to consider a third party review of noise, over-pressure and ground vibration. It is our understanding that third party reviews were considered for air quality and economic chapters of the EIS. It is unclear why on this issue, this approach has not been considered for Bridges Acoustics or Kannegieter Reports.

5.3 Department's Report – Section 6.3.2 Noise

Page 61 Background Noise

The Department continues to rely on background noise completed in 2011. The Department or Bridges Acoustics does not provide evidence to suggest that the 2011 background noise measurements are valid for the current application.

Page 62 Receivers

The Department relies on noise modelling that:

- Has not been calibrated
- Uses noise data that has not been appropriately sourced or referenced.
- Considers mobile plant as stationary equipment.
- Relies on noise control without the support of manufacturers.
- Accepts the findings of *All Modelled Years* – This statement is not defined within the Bridges Acoustics submission and is meaningless.

5.4 Department's Report – Section 6.3.3 Blasting and Vibration

The Department considers the assessment only on theoretical data. It should have been best practise to calibrate the blasting assessment for local conditions. Utilising data from the existing operations at the Drayton Mine. That would have allowed for a calibration and validation process to be incorporated within the model.

The proposed blasting criteria is mostly associated with structural damage. This is not an appropriate criteria to assess impact on human or animal comfort. It is considered “best practise” for blasting events that occur daily (on average) that the blasting criteria detailed Section 2.7 of this report be considered.

5.5 Appendix D – Response to Submissions dated July 2015

Appendix D is the response and further assessment by Bridges Acoustics as instructed by Hansen Bailey. The Bridges Acoustics assessment for Appendix D has been based on the approach and methodology undertaken in the Bridges Acoustics EIS Report. Hence the findings presented in Section 5.2 of this report are also valid for Appendix D.

6 Summary

The Bridges Acoustics and Kannegeiter reports do not provide the confidence or transparency expected when assessed against “best practice” methodologies and procedures. The reports do not provide sufficient details to ensure that proper analysis of data and methodologies has been completed. In summary, the following areas are questionable and incomplete:

- An assessment of the impacts from the proposed development on human and animal comfort.
- No validation or calibration of the theoretical models for noise, over-pressure and vibration from ground blasts.
- Inadequate reporting of noise plots and scenarios.
- Inappropriate use of noise modelling software that is not commercially available and no longer supported. This lacks transparency and repeatability.

The EIS does not demonstrate a true representation of current or future noise and blast vibration impacts. The PAC and the Department cannot rely on the findings of the current state of the EIS.